

FOR MYSORE STATE

P.W (1955) Department.

MS SERIES.

G.O. No. 2191

2191

Dated 3-6-1955

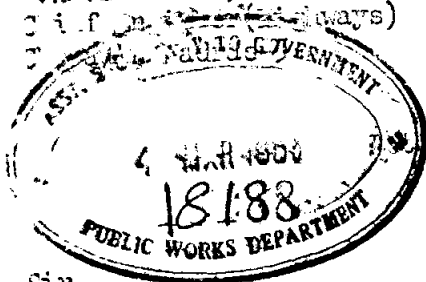
[Despatch Abstract]

Communications - Roads of Mysore  
State importance - South Kanara  
Construction of bridge at Ankur  
to join Basara Const. Road.  
Mysore Estimates for Rs. 13.17  
Approval of Govt of India.

From  
Sri. M. V. Nambiar, B.E., M.I.E., (Ind)  
C. Inst. M.E. (Eng) M.I. (Am.E. (Eng)  
M. Inst. Soc. C.E., I.R.  
Chief Engineer (Highways)  
P.W.D. Madras

To

The Secretary to Government,  
P.W.D. Madras



Order No. 3004 JI/55-2 dated 4/3/55.

Sir,

Sub: Communications - Roads other than National Highways - execution of certain road works outside 5 year plan under special grant-in-aid scheme of Government of India - Constructing a bridge across Udayavar river in mile 30/5 of Mangalore Palindur Coast Road - estimate for sanction - regarding

I forward herewith an estimate for Rs. 13.17 Lakhs for the construction of a bridge across Udayavar River on the Mangalore Palindur Coast Road.

This work is included as item No. 19 of the work selected in the Government of India letter M.P.L.15(12) 53 dated 6-5-54 in the scheme to be executed under Grant-in-aid by the centre. I request that the technical approval and financial sanction of Government of India may be obtained and communicated.

An advance copy of the estimate is being sent to the Consulting Engineer (Road Development) for his early scrutiny.

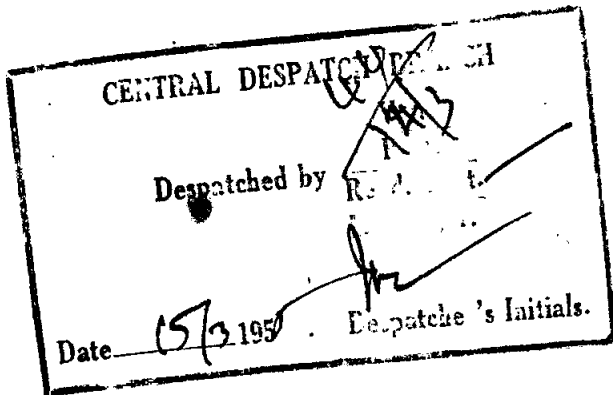
Enc: Two copies of  
Estimates

*A. V. Jagannathan*  
for CHIEF ENGINEER (ROADS)

one advance copy of the estimate to the Consulting Engineer (Road Development) for early scrutiny. 5'-0" box girder adopted is similar to that proposed for the bridge across Cauvery near Tiruchy

By Regd. Post.

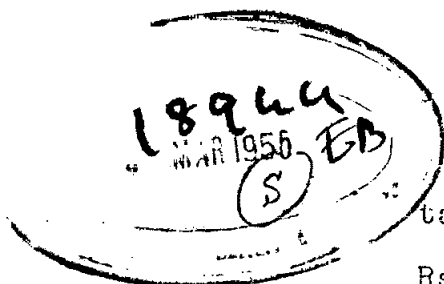
Encl.-Estimate and plans  
at (S).



*Not put up*

*15.60 lakhs*

Copy to the C.E.(H).



P.W.D. U.O.N.O.

18.188A/55-1

7-3-55

*5.3.55*  
*Kon*  
*5.3.55*

Letter No. 18108 A/55-2 D/14-3-55

To

The Secretary to the Govt. of India  
Ministry of Transport (Roads Wing)  
Jammagar House, Shahjahan Road,  
NEW DELHI.

Sir,

Sub: Roads of inter-State or  
economic importance - Con-  
structing bridge across  
Udayavar river in mile  
33/5 of Mangalore Baindur  
Coast road in South Kanara  
district.,

Ref: Ministry of Transport's  
letter No.PL-15(12)53,  
dated 6-5-54.

I am directed to forward herewith  
a detailed estimate and plans for the  
work of "constructing a bridge across  
the Udayavar river in mile 33/5 of the  
Mangalore Baindur Coast road" which is  
item No.19 in the statement attached to  
the letter cited. I am to request that  
the technical approval and financial  
sanction of the Govt. of India to the  
detailed estimate *for Rs 13.17 lakhs* may be obtained and  
communicated to this Govt. at an early  
date.

*7.3.55* Y. F.

Note:- The cost of the work according to the de-  
tailed estimate is Rs 13.17 lakhs against the provision  
Rs 15.60 lakhs for in the approved programme. The dr  
above is for approval. Finance may see before issue.

*7.3.55* Fin

2 Q /

Fin (CR)

The draft letter overleaf may be

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8.3.55

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8/3/55

P.W.

P.W (P2)

Issue.

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9.3.55

KW

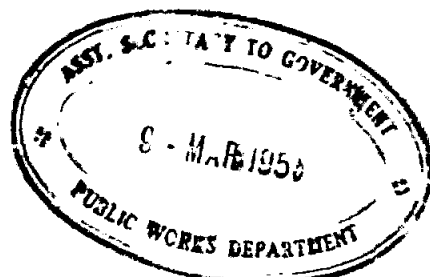
9.3.55

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12/3/55

Fin L.O 18966 Exp D1

18966 9/3/55.

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**CENTRAL DESPATCH BRANCH**

Van. ☒  
 Post. ☒  
 Despatched by Regd. Post. Messenger.

Date 26/11/1955 Despatched by *[Signature]*

Letter No. 18/88 A/55-3 Dated 25/4/55

To

The Secy. to the Govt of India,  
 Ministry of Transport (Roads Wing),  
 Jamnagar House, Shahjahan Road,  
New Delhi.

Sir,

Subj.: Roads of inter-state or  
 economic importance —

Constructing bridge across  
 Udayavari river in mile  
 33/5 of Mangalore Bandipur  
 Coast road in South  
 Kanara district (Job  
 No. E&I/MD/58)

Ref. Ministry of Transport

letter No. PL-15(12)53 of 6-5-54

11/4/54

I am directed to  
invite reference to this  
Govt. letter No. 18/88 A/55-2  
dated 14-3-55 and to  
enquire when a reply  
thereto may be expected.

10/4/55  
p 3 of

25/4/55  
25/4/55

25.4.55 Y.F.

copy to HLR(4)

NR  
2/5

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7

GOVERNMENT OF INDIA

TRANSPORT MINISTRY  
(ROADS WING)

Telegrams  
"ROADIND"

**EXPRESS LETTER**

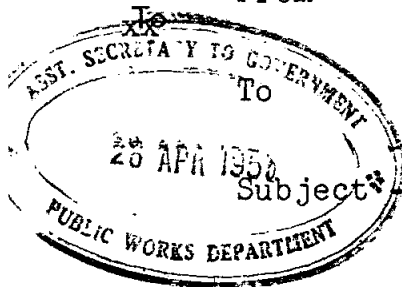
Jamnagar House,  
Shahjehan Road.

N. B.—This is an ORIGINAL MESSAGE, sent by post to save telegraphic expense and undue use of the wires, but intended to be treated, on receipt, with the same expedition as if it had been telegraphed. To save time and formalities it is worded and signed as if it had been so despatched.

No. WIV-49(6)/55 Dated New Delhi-2, the 27 APR 1955 195

From

The Under Secretary to the Govt. of India.



The Secretary to the Govt. of Madras,  
Public Works Department, Madras.  
Construction of a bridge across the Udayavar  
river in mile 33/5 of Mangalore-Baindur  
Coast Road.

p3 ante Reference. Your letter No. 18188-A/55-2, dated the 14th  
March 1955.

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p7 6/5/55  
Copies of letters No. WIV-49(6)/55, dated the  
15th April 1955 and the 22nd April 1955, from the  
Chief Consulting Engineer(Road Development) to the State  
Engineer on the plans and estimate for the work  
mentioned above are enclosed. The latter may be  
asked to furnish the requisite information immediately.

Fateh Chand 27/4/55  
(Fateh Chand)

for Under Secretary to the Govt. of India.

Enc:- Copies of letters. p9 below

"JAGAT"

Copy of letter No. WIV-49(6)/55, dated the 15th April 1955, from the Consulting Engineer(Road Development), Ministry of Transport(Roads Wing), New Delhi to the Chief Engineer (Highways), Chepauk, Madras.

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Subject:-Construction of a bridge across Udayavar river in mile 33/5 of Mangalore Baindur Coast Road.

----

Reference. Your endorsement No. 3004 JI/55-2, dated the 4th March 1955.

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✓ Please refer to the letter under reference and the connected proposals.

It is noticed that about 3000 ft. upstream at the section marked AB in red pencil in the Plan the river is very much narrower. It may please be reported if it would be feasible to construct the bridge at this constructed section thereby effecting considerable savings in the cost of the bridge even, after making due allowance for the extra cost of making a longer length of Approach road on either side of the crossing. It may be examined if there is any serious difficulty in giving effect to this proposal. If this proposal is agreeable to you, necessary modified plans, and estimates may be submitted very early to enable the Govt. of India to accord technical approval and financial sanction to the Project. A very early return of this case will be very much appreciated.

2. The plans estimates received with your endorsement under reference are returned herewith.

II

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Copy of D.O. letter No. WIV-49(6)/55, dated the 22nd April 1955 from the Ministry of Transport (Roads Wing), New Delhi to Shri K.K. Nambiar, Chief Engineer(Highways), Madras.

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Please refer to this office letter No. WIV-49(6)/55, dated the 15th April 1955, relating to the construction of a bridge across Udayavar river in M 33/5 of Mangalore Baindur Coast Road. Shri S.L. Bazaz, Deputy Consulting Engineer (Bridge) who was away on leave at the time when the letter under reference was written to you has since returned. It is understood from him that the site referred to in this office letter was not considered suitable mainly because of the high incidence of cost of forming approach roads due to the heavy cost of conveyance of earth by boat from a long distance. The approximate cost of this alternative proposal may kindly be furnished in order to enable this point to be examined in detail. I shall be grateful if you will be good enough to transmit the above information at your earliest convenience so as to enable the Govt. of India to accord sanction to the work expeditiously.

-----

True copy

for Section Officer

MIS.

Immediate

FOR PERSONAL ATTENTION

P.W(A2)

11  
Memo. No. 18188 A/55-4 Dated 28-4-55

Subj: - Com<sup>ns</sup> Roads of economic  
or inter-State importance —

South Kanara district —

Construction of bridge across  
Udayavar river at mile 33/5  
of Mangalore Baramdar Coast  
road.

Ref: - From the Govt of India,  
Express letter No. WIV-49(6)/55  
dated 27-4-55

The attention of  
the CE(H) is invited  
on the subject matter  
the letters noted

(X) Letter No. WTV-49(6)/55  
dated 15-4-55  
Letter No. WTV-49(6)/55  
dated 22-4-55

$$\begin{array}{r} 2874 \overline{) 5} \\ 2874 \phantom{00} \\ \hline 2874 \overline{) 55} \\ 2874 \phantom{00} \\ \hline 2874 \overline{) 555} \\ 2874 \phantom{00} \\ \hline \end{array}$$

28.455

To

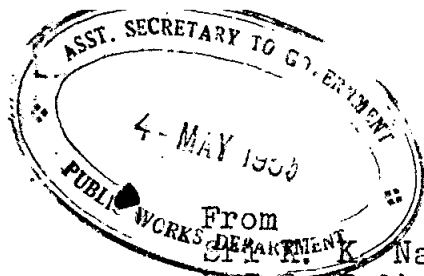
The CE(H)

CENTRAL DEPT. OF JUSTICE

RECEIVED

9284m

Despatcher's Initials.



HIGHWAYS DEPARTMENT

13

From  
S. H. K. Nambiar, B.E.,  
M.I.E. (Ind) F.Inst.H.E. (Eng),  
M.I.Mun.E (Eng), M.Am.Soc.C.E.  
Chief Engineer (Highways),  
Chepauk, Madras-5.

To  
The Secretary to Government,  
Public Works Department,  
Madras-9.

Letter No. 3004 J1/55-3 dated 2nd May 1955

:::

Sir,

36605

Sub: COMMUNICATIONS - Roads of economic  
or inter-State importance - South  
Kanara District - construction of  
bridge across Udayavar river at M.33/5  
of Mangalore Baindur Coast road.

P.311-1200

Ref: Government Memo No.18188 A/55,4 P.W.D.  
dated 28.4.1955

:::

The matter is under correspondence with the Superintending  
Engineer (Highways) Cannanore. A reply will be sent to Government  
on receipt of the Superintending Engineer's report. Government of  
India's letter No.WIV\_49(6) dated 22.4.55 has not been received in  
this office. I request that a copy of the same may be sent for  
reference.

M. N. S.  
255

Nsk/020555

for CHIEF ENGINEER (HIGHWAYS).

34  
6/5

Memo No. 18/88 A/55-5 Dated 5-5-55 P.W(A21)

Sub: (as on p13 ante)

Ref: From HCE(A) letter No. 3004-JI/55-3  
dated 2-5-55

p13 ante

A copy of letter No. WIV-49(6)/55 dated 22-4-55 of the Govt of India is furnished. He is requested to furnish the requisite information direct to the Consulting Engineer (Road Dept) expeditiously.

11  
p9 ante

4/5/55  
5/5/55

5.5.55

|                         |           |
|-------------------------|-----------|
| CENTRAL DESPATCH BRANCH |           |
| 400                     |           |
| 11                      |           |
| To                      |           |
| Date 7/5/55             | Signature |

Copy of letter  
on p9 ante

S.W. (H2)

Letter No. 18188 A/55-6 <sup>15</sup> / Dated 23-5-55

To

The Secy to the Govt of India,  
Ministry of Transport (Roads Wing),  
Jammagar House, Shahjahan Road,  
New Delhi.

Sub: Roads of inter State or

economic importance —

Constructing bridge across

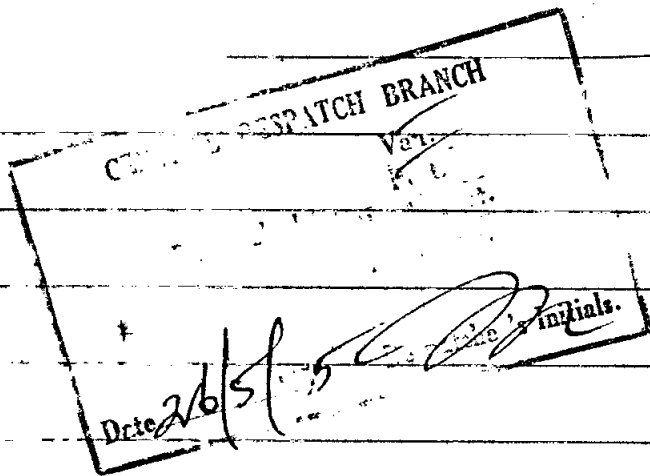
Udayavar river in mile

33/5 of Mangalore Bainsur

Const road in South

Kanara district

Ref: This Govt. letter No. 18188-  
A/55-2 dated 14-3-55



b3 c7

18  
Ministry of Transport & Public Works

No. WIV-49(6)/55 dt 27-4-55

107

I am directed to enquire when the approval of the Govt of India to the detailed estimate may be expected.

23-5-55

Y.F.

23-5-55

copy to RICE(H)

Kew  
23-5-55

Telegrams

ROADS WING



GOVERNMENT OF INDIA.

30 MAY 1955

MINISTRY OF TRANSPORT : ROADS WING.

44035

JAMNAGAR HOUSE,  
Shahjahan Road.

No. WIV-49(6)55.

New Delhi-2, the

From

Shri Harbans Singh,  
Under Secretary to the Govt. of India.

6 MAY 1955

To

The Secretary to the Govt. of Madras,  
Public Works Department, Madras.

Subject: Construction of a bridge across the Jayavar river a mile 33/5 of the Mangalore-Baindur Coast Road in the South Kanara District. [JOB NO. EMI/AD/181].

Sir,

With reference to your letter No. 18188-A/55-2, dated 14th March 1955, I am directed to say that the estimate for the work mentioned above has been examined by the Consulting Engineer (Road Development) and a technical note by him is attached. I am to request that the State Chief Engineer may be asked to settle the points raised therein direct with him.

2. I am to convey the technical approval and financial sanction of the President to the estimate amounting to Rs. 13,17,000/- (Rupees thirteen lakhs and seventeen thousand) only for the work mentioned above. Any excess over the sanctioned amount should be met from State funds. No agency charges are admissible in respect of this work.

3. The expenditure on the work to the extent of Rs. 13,17,000 is debitable to the sub-head "A-4 Construction of State Roads of economic or inter-State importance" subordinate to the major head "81-Capital Account of Civil Works Outside the Revenue Account" for which the Demand number for the current financial year is "134-Capital Outlay on Roads". Audit are being informed accordingly. I am to request that the amount required for expenditure on the work in question during the current financial year may be intimated to this Ministry at an early date.

4. The work has been assigned Job No. EMI/AD/181. This Job No. may kindly be quoted in all future correspondence regarding the work.

5. I am to request that arrangements may be made for the submission of monthly progress reports on the work in the prescribed form to the Consulting Engineer (Road Development) direct by the Executive Engineer concerned. A completion report on the work may also be furnished to the Government of India in due course.

6. I am to further request that a copy of the sanctioned estimate may be furnished to this Ministry for record in due course.

Technical note

Estimate

GH"

55.

Yours faithfully,

Under Secretary to the Govt. of India.

Original sent to C.E. 19/

Copy of the letter No. XIV-49(6)55, from Government of India, Ministry of Transport, Roads Wing, New Delhi.

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TECHNICAL NOTE.

The Udaywar Bridge at mile 33/5 of Mangalore-Udupi Road.

1. Foundations

- (i) The two wells under each pier are proposed to be kept at a clear distance of 5 ft. This distance may be reduced to 4 ft. or even less, if such reduction will not interfere with the sinking of the wells.
- (ii) The returns and the wells under the returns may be omitted and the butment treated as a buried abutment. A similar design has been suggested and approved for the Pav nje bridge on the same road.
- (iii) Now dowel bars need be provided for anchoring any of the wells unless they are proposed to be founded on sloping rock.
- (iv) The thickness of the well steining may be increased from 1 ft. to 2 ft. 6 in.

2. Sub-structure.

- (i) The top width of the piers may be reduced from 6 ft to 5 ft. and the faces given a batter of 1 in 24.
- (ii) The bases of the butments are proposed to be kept centrally with reference to the wells. Since the abutments are subjected to earth pressure also, it is suggested that they may be kept eccentric with respect to the wells. The abutment may start from the same side edge of the well cap and leave a clear distance of 1 ft. on the water side as illustrated below. Suitable modification may be made in the design of the well caps.

(Diagram)

A similar modification may please be made in the setting out of the abutments of the Pav nje bridge also.

3. Superstructure.

- (i) Calculations for the design of the superstructure and bearings may please be sent early.
- (ii) The concrete in the superstructure may be changed from 1:1½:3 ordinary grade to 1:2:4 high grade.
- (iii) The thickness of the deck slab may be decreased from 9 inches to 8 ins. and the reinforcement suitably increased if necessary.
- (iv) The thickness of the soffit slab may be decreased from 6 ins to 5 ins.

21  
4. General.

- (i) The rough stone packing and the base slab in concrete 1:3:6 proposed below the approach slab in the substituted by a base course of 15 cm. concrete. Be substituted.
- (ii) A drawing incorporating the changes suggested in the technical note may please be sent before the work is taken up for execution. Alternative designs L span
- (iii) Contractors may be allowed to submit alternative designs including balanced cantilever and other design.

(T.O.V. CO. 1)

00/16

IDENT.

2 Drafts  
F. Section  
Location  
B L  
p 174  
3/6/55

para 2 p 174

p 4306 C.W.  
bridge

✓ (D)

para 1 p 174

p 174-210

para 4 p 174

P.W.D. (A-2)

Communications - Roads of economic and inter-State importance - South Kanara Dt. Construction of bridge at mile 33/5 of Mangalore Baindur Coast Road - Job No. E. & I/MD/181 - Estimate for Rs 13.17 lakhs - Approval of Govt. of India - Communicated

Ref: From the Govt. of India, letter No. W.IV-49(6)-55 dated 26-5-55.

G.O. MS. NO. 2191 P.W.D., d/ 3-6-55

In their letter cited, the Govt. of India have accorded technical approval and financial sanction to the detailed estimate for Rs 13,17,000 (Rupees thirteen lakhs and seventeen thousand only) for the construction of a bridge across the Udayavar river at mile 33/5 of the Mangalore Baindur Coast Road in South-Kanara District.

2. The expenditure should be debited to "50.h.Civil Works - Development Schemes - II.Other Development Schemes - (ii) Communications - Highways Department - C.Major District Roads". The amount recovered from the Govt. of India should be credited to "XXXIX.Civil Works - C.Recoveries of expenditure - Receipt of the Highways Department".

3. The estimate received with the letter cited is forwarded to the C.E.(H) for necessary action.

The C.E.(H) is requested to settle the points raised in the technical note attached to the letter cited direct with the Consulting Engineer (Road Development).

4. The Govt. of India have assigned Job No. E. & I/MD/181 to this

24

work which should be quoted in all future correspondence regarding the work.

5. The C.E. is requested to instruct the D.E.(H) concerned to send monthly progress reports on the work in the prescribed form to the Consulting Engineer (Road Development) *direct*.

6. A completion report on the work should be furnished as soon as the work is completed for sending it to the Government of India.

7. The C.E. is requested to furnish a copy of the sanctioned estimate for sending it to the Government of India.

Para 6 p17 cf

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Kuv  
31.5.55

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1.6.55

To

The C.E.(H) with estimate  
and copy of pp. 17-21 c.f.  
The A.G., through I  
Finance.  
Duplicate copy to I with copy  
Sri A.K.Raman, I of page  
A.G., Madras. I 47 c.f.

(2 Sec with copy of  
17-21 c.f.)

Draft II

25

P.W.D. (A-2)

Letter No. 18188-A/55-8 Dated 3-6-55

To ✓  
The Secy. to the Govt. of India,  
Ministry of Transport (Roads Wing),  
Jamnagar House,  
Shahjahan Road,  
New Delhi-2.

Sir,

Sub: Construction of bridge across  
Udayavar river at mile 33/5  
of Mangalore Baindur Coast Road  
in South Kanara District -  
(Job No. E. & I/MD/181).

Ref: Ministry of Transport's letter  
No. WIV-49(6)55 dated 26-5-1955  
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I am directed to state that a  
sum of Rs 6,00,000 (Rupees six lakhs) is  
required for expenditure on the work  
during the current financial year.

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1.6.55 Y.F.

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1.6.55

✓ Copy to the C.E.(H)

Despatched

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31.5.55

p174

1243 of P.W.  
Budget

Sub: COMMUNICATIONS - Roads of economic and Inter-State importance - South Kanara Dt. - Construction of bridge across Udayavar river at mile 33/5 of Mangalore - Baindur Coast Road - Approval to estimate.

Ref: From the C.E.(H) letter No.3004-J1/55-2 dated 4th March 1955.

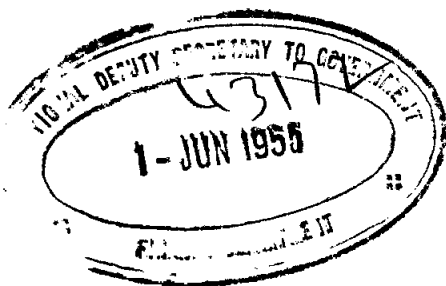
From the Govt. of India, letter No.W.IV-49(6)55 dated 26th May 1955.

The work of constructing a bridge at mile 33/5 of the Mangalore Baindur Coast road at a cost of Rs.15.60 lakhs in South Kanara is one of 21 works approved by the Govt. of India under their grant-in-aid scheme for development of roads of Inter-State or economic importance. A detailed estimate amounting to Rs.13.17 lakhs was forwarded to the Govt. of India for their approval. The Govt. of India have since accorded technical approval and financial sanction to the detailed estimate for Rs.13.17 lakhs. They have requested that the amount required for expenditure on the work during the current financial year may be intimated to them.

2. The estimate received from the Government of India may be forwarded to the C.E.(E) for necessary action.

2. A sum of Rs.6 lakhs has been provided for this work in the budget for 1955-56. With reference to 'A' above, the Govt. of India may be informed that an expenditure of Rs.6 lakhs is likely to be incurred on the work during the current year.

3. A draft order and a draft letter are submitted below for approval. Finance may see before issue.



31.5.55  
K.W.  
31.5.55

31.5.55  
1.6.55  
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1.6.55

7 ai

F.W.D. No. 18188 A/55-7  
1-6-55

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For (copy)

The draft letter below may be  
forwarded.

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2-6-55

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2/6/55

P.W.(A)

P.W.D. 43172/EB/55-1

45260

dt 2/6/55

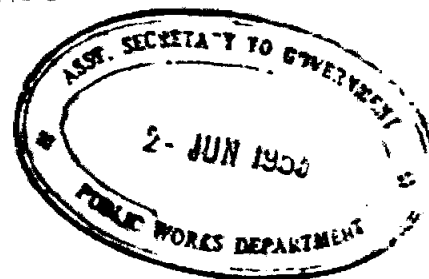
The drafts below may

issue.

2  
2/6/55

K.M.  
2-6-55

13  
3.6.55



(Issued as G.O. Ms. No. 2191 dated 3-6-55) 10/2224 ✓

(Issued as Letter No. 18/88A/55-8 dt 3-6-55) 10/225 ✓

REPORT TO ACCOMPANY THE ESTIMATE FOR CONSTRUCTING A BRIDGE ACROSS UDAYAVAR RIVER AT MILE 33/5 OF MAN ALOKE BAINBUR COAST ROAD(NINE SPANS OF 90 FT. CLEAR).

Estimate

Rs.13,17,000-0-0

1. NECESSITY:

The coastal road from Mangalore to Baindur is crossed before reaching Udupi, the next important place after Mangalore, by the Pavanje river at mile 13/2, Mulki river at mile 18/4 and Udayavar river at mile 33/5, all these crossings being unbridged at present. The coastal area here is densely populated and intensely cultivated. The local public, the afore, are put to much inconvenience being necessitated to cross the river by means of ferries maintained at these crossings. People going from Mangalore to Udupi, an important pilgrim centre, and to Malpi, a minor port, (both of which are on the coast enroute to Baindur) have to take a circuitous route involving an extra distance of 20 miles if the crossings by the ferries are to be avoided. So bridging these rivers at the above crossings was a very long felt need and hence the Government of India in their letter No.PL.15(12)53 dated 6-5-54 selected them in the schemes to be executed under Grant-in-aid by the centre, the bridge across Udayavar river at mile 33/5 being list as item 19 of the 20 schemes selected.

2. SITE:-

Four possible sites for the bridge are considered(Vide sketch showing proposed alignments).

Site No.1 is about six furlongs upstream of the ferry crossing. Though the river appears narrow here, the approaches have to be taken on a long detour further away from the inhabited area, besides involving heavy acquisition of gardens and wet lands. Hence this does not appear suitable.

Site No.2 is about 500 ft. upstream of the ferry crossing. Here two bridges have to be constructed across the two arms of the river with lineal water ways of 500' and 120' i.e. 620' total with road formation between the bridges in the island portion for a length of 300 ft. In the island portion two culverts have also to be constructed. The approaches on either side will have to be formed, through wet lands and coconut tops involving acquisition to an extent of about 10 acres. The length of approaches will be 3 furlongs each on either side.

Site No.3 is situated about half a furlong downstream of the existing ferry crossing. At this site the width of the river is 490 ft. on the left arm and 310 ft. on the right arm with a central island of 60 ft width. The total length of 865 ft. including the width of the island has to be bridged. The approach on the Mangalore side will take off at mile 33/2 towards the left at the bend. This has the advantage of having short and straight approaches on either side though the lineal waterway will be slightly more than that for No.2 site.

Site No.4 is about 1 1/2 miles downstream of the present ferry site. Good is available at bed level at this site and the width of the river is only 770 ft. but the formation of approaches will involve an extra length of 2 miles and an acquisition of 20 acres of paddy fields with the added disadvantage that it is very far away from the inhabited area.

Hence sites 1 and 4 do not appear feasible and site 3 being preferable to site No.2 has been chosen as the best.

3. HYDRAULIC CALCULATION

The river has its source in the plateaus about 27 miles east of the proposed bridge site. The bedfall of the river is about 250 ft. from source to site. The catchment map as got from the topo maps of the survey of India is 116 sq.miles. The peak run-off from the catchment as calculated by Ryve's formula adopting the value of 1500 for 'C'(found suitable for the locality), works out to 35680 cusecs. That arrived at by the theoretical method from intensity of rainfall as explained in article 4 of Paper No.167 I.C.E. is 35060 cusecs. The usual method of calculating the discharge by the cross-section and bed slope method is inapplicable in this case as it is a river subject to tidal action, wide and shallow in some places, and meandering without well defined banks. Therefore the lineal waterway has been designed for the maximum of the discharges arrived at by the first two methods and an effective lineal water way of 905 ft. was found necessary. But as the width of the river from bank to bank is 865 ft. 9 spans of 90 feet giving a clear lineal

water way of 810-90) 720 ft. clear deducting ~~20~~ for one ineffective span opposite the island have been provided.

The highest flood level as ascertained by local enquiry is 101.80. The velocity at H.F.L. works out to 3.68 ft. per second. The lowest L.F.L. is 92.25 and the highest H.F.L. 97.30.

#### 4. GEOLOGICAL DATA

The average depth of foundation from the top of the pier is 54 ft. and so the approximate economic span works out to  $1\frac{3}{4} \times 54 = 94.5$  ft. Ninety feet span have therefore been adopted.

#### 5. SOIL ANALYSIS.

borings taken at the site revealed 8 to 15 ft. of sand below bed and then clay and sand for varying depths till hard granite rock is met with at about level 48.00 to 60.00 in the different bores. In the last 3 bores near the right bank soft laterite has been met with at about level 70.00. However as hard granite rock is met with at about 45 ft. below bed it is proposed to found the bridge on this hard granite rock.

Circular walls of cement concrete 1:3:6 9 ft. internal diameter with 2 ft thick staining are proposed for the foundations. Each pier and abutment will have two such walls spaced 5 ft. apart. There will be one extra wall for each wing. The wall curbs will be of R.C.C. 1:2:4. Necessary islands to cast the wall curbs will be formed to just above the prevailing high tide level and the walls sunk from this level. After the walls are sunk to touch hard granite rock steel bars will be fixed into the hard granite rock to prevent the wall tilting by longitudinal forces and the bottom of the walls plugged with cement concrete by the bottom opening bucket system or trawl method. The top plug of the wall will be of cement concrete 1:4:8, 2 ft. thick, the space in between the top and bottom plug being filled with clean sand. A capping slab of R.C.C. 1:2:4, 4 ft. thick in the case of piers and 2 ft 3 in. thick in the case of abutment and wings, suitably reinforced will be laid over the walls the bottom of the capping slab being kept at ordinary low tide level viz 94.00.

#### 6. SUBSTRUCTURE.

The abutments and piers will be of coursed rubble in cement mortar 1:4 with simultaneous pointing finish and of 2nd sort and 1st sort respectively.

The abutments have been designed to take up the earth pressure as per Coulomb's theory in addition to the superimposed dead load coming over them. The wall will be 10 ft. wide at bottom and 8 ft. at bearing level. The back wall over them will be 5 ft. thick at bottom and 2 ft. at road level.

The wings will extend to 14 ft. behind the back face of the abutment wall as to allow a 1:1 slope for the embankment. The bottom width of the wing wall will be 10 ft and top width 1 ft. at road level.

The piers will be 6 ft thick and 21 ft long straight with semi-circular cutwaters at ends.

The bed blocks will be of R.C.C. 1:2:4, 1'-6" deep and will be laid for the full length of the pier including cutwaters. In the case of the bed blocks below the fixed ends, they will be 10" more in depth to make up for the difference in depths of the fixed and roller bearings. A suitably reinforced R.C. approach slab is also provided.

#### 7. PIERES BOUND

A vertical clearance of 4 ft. has been provided between the H.F.L. and the bottom of the deck as required in the I.R.C. Bridge code.

#### 8. SUPERSTRUCTURE.

The decking for the 90ft. clear span will be R.C.C. hollow box girder (Simply supported). The overall depth of the box girder will be 7'-0". The thickness of bottom slab will be 6". The deck slab will be 9" thick. The webs also will be 9" thick. The section of the girder comprises of 2 cells 8'-4 1/2" x 5'-9" with 4 intermediate diaphragms 10" thick and two end diaphragms 12" thick. Fillets 15" x 6" are provided at the junction of web and deck slab and fillets 8" x 4" are provided at the junction of web and bottom slab. The diaphragms will have an opening of 4'x3' to facilitate removal of the snuffing of the deck slab, web and diaphragms

The cantilever portion of the deck slab will be 3'-9" and will be 6" and 10" thick at end and support respectively. The clear roadway over the bridge will be 24'-0".

The proportion of the concrete mix will be 1:1½:5. Vibrated concrete will be adopted for this as well as all other R.C.C. items to secure better results.

The structure is designed to take up I.C.C. class A double lane or Class A single lane loading whichever gives the maximum effect.

Over the decking, cement concrete wearing coat will be laid for 3" uniform thickness. Architectural hand rails will be provided on either side. Vibration is introduced for securing better results in the concrete.

#### 9. APPROACHES.

The approach road takes off very near 33/2 furlong stone on the Mangalore side. The corresponding chainage on the longitudinal section is 2545.

In the horizontal plane the road takes off almost straight from chainage 2545 without bending to the right as at present. In the same straight line it will cross the river and continue on till it meets the existing road between furlong stones 33/6 and 33/7. A transition curve of minimum radius 500 ft. will be put in at this junction.

In the vertical plane it will have a rise of 1 in 30 from chainage 2545 to 2600 so as to be 2 ft above the H.F.L. (103.50). From here it will be continued level up to chainage 2915, from where it will rise up at 1 in 30 to LL2.83 (Road level over Bridge) at chainage 3200. The bridge proper (face of abutment) commences at chainage 3300 and ends at chainage 4158. The approach will then be continued on the Udipi side level up to the chainage 4258 after which it will fall with a slope of 1 in 30 to 103.50 at chainage 4530. It will then be continued level from here till it meets the existing road level at chainage 5630.

On the Mangalore side, the approach crosses a small channel used for irrigation purposes at chainage 3025. The present width of the channel is 3 ft. and so a culvert of 3' span is proposed at this place.

On the Udipi side the existing culverts at chainage 5420 and 5620 are in a dilapidated condition and so they are proposed to be reconstructed.

The embankment of the approaches will be formed with gravely soil suitable at about ½ mile upstream of the river. They will be revetted from chainage 2915 to 3200 and 4158 to 4530 as the height of the embankments are heavy here. At the culverts also revetment will be provided for the quadrant portion and 10' length beyond. The sides of the embankment will be 1 to 1 in the revetted portion and 1½ to 1 in the other portions.

Over the approaches laterite soling 6" thick will be laid and consolidated for 13 ft. width. Over this 5" thick M.B.R. with hard granite metal in two layers of 3" and 2" respectively will be spread and consolidated with power roller for 12 ft. width. Metal lining is provided from the abutment to 10'-0" beyond the pier for the full width between the wings, and the full width is reduced to 13'-0" in a distance of 50'-0".

R.C.C. hand railings will be provided on both sides for the revetted portion of the approaches.

The approach roads have to be formed on Patta lands and so necessary charges for acquiring the lands for 100 ft width as per standard requirements for I.E.R. have been provided except in two places, where house sites come in and the minimum of 66' are provided here to avoid the acquisition of houses. A tiled shed in the island falls on the alignment and so provision for acquiring this has been made.

#### 10. GENERAL.

Provision has been made in the estimate for temporary buildings for office and sheds for storing materials, plant and equipment and for an inspection shed. Provision has also been made for putting up gate stone besides the usual provision for contingencies and petty supervision.

The rates adopted are the current schedule of rates of South Kanara District.

~~The work will be carried out as per M.B.R. and other relevant special~~  
contract conditions and rates.

The work will be carried out as per S.D.S. and other relevant  
special specifications and circulars.

(sd) R.K. Masbini,  
Chief Engineer(Highways)

(TUBE CO Y)

*S. V. Padhan* 2/3  
TECHNICAL ASSISTANT TO  
CHIEF ENGINEER(HIGHWAYS).

2/3 1/5  
2/3 2/10

Name of work: Constructing a bridge across Udayavar River at mile 33/5 of Mangalore Baidur Coast Road

Abstract Estimate

Estimate Rs. 13.17 lakhs

| Qty.,     | Description of work                                                                                                                                                                                                                                                                                                                            | Rate                      | Per    | Total      | Amount |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------|------------|--------|
| 3400 Cft  | Reinforced concrete 1:2:4 with 3/4" B.S.S. hard granite metal using 4.33 lbs of steel per cft of concrete including cost and conveyance of all materials except cement and steel and inclusive of cost of bending bars, tying grills, centering, etc., complete for well curbs"                                                                | 2-2-0                     | Cft    | 7225-0-0   |        |
| 62100 Cft | Cement concrete 1:3:6 with 1 1/2" B.S.S. hard granite metal including cost and conveyance of all materials except cement and inclusive of cost of moulds, placing, curing etc., complete for Well steining                                                                                                                                     | 83-0-0                    | 100Cft | 51543-0-0  |        |
| 5.6 Tons  | Labour charges for mild steel wrought and put up for single iron cutting edges below wells                                                                                                                                                                                                                                                     | 140-0-0                   | Ton    | 784-0-0    |        |
| 11.2 Tons | Labour for bending and tying grills for "Bond rods and Hoops" in well steining                                                                                                                                                                                                                                                                 | 7-0-0                     | Cwt    | 1809-0-0   |        |
| 1050 Rft  | Sinking cement concrete circular wells of 13'-0" outer diameter with 2 ft thick steining through all soils of description including formation of islands and removing islands etc (depth reckoned from ordinary high tide level)                                                                                                               | 130-0-0                   | Rft    | 136500-0-0 |        |
| 816 Nos   | Providing and fixing dowel bars 1" diameter 3'-9" in side bed rock and 3' 0" inside plugging excluding cost of steel but including drilling holes 2" diameter and grouting                                                                                                                                                                     | 9-10-0                    | each   | 7854-0-0   |        |
| 9500Cft   | Cement concrete 1:2:4 with 1 1/2" B.S.S. hard granite metal including cost and conveyance of all materials except cement for bottom plugging inside wells either by bottom open bucket system or Tremies method                                                                                                                                | 68-0-0                    | 100Cft | 6460-0-0   |        |
| 51100Cft  | clean<br>Plugging wells with/river sand                                                                                                                                                                                                                                                                                                        | 2-8-0<br><del>2-8-0</del> | 100Cft | 1278-0-0   |        |
| 3060Cft   | Cement concrete 1:4:8 with 1 1/2" B.S.S. hard granite metal including cost and conveyance of all materials except cement for top plugging of wells                                                                                                                                                                                             | 53-0-0                    | 100Cft | 1622-0-0   |        |
| 9620 Cft  | Vibrated reinforced cement concrete 1:2:4 with 3/4" B.S.S. hard granite metal using 7.44 lbs of steel per Cft of concrete including cost and conveyance of all materials except cement and steel and inclusive of the cost of bending bars, welding them, tying grills, centering, baling out water etc. complete for capping slabs over wells | 4-0-0                     | Cft    | 38480-0-0  |        |
| 9320Cft   | Coursed rubble masonry I sort in cement mortar 1:4 including simultaneous pointing finish with cement mortar 1:3 including cost and conveyance of all materials except cement                                                                                                                                                                  | 102-0-0                   | 100Cft | 38480-0-0  |        |

9506-0-0

|                                                   |                                                                                                                                                                                                                                                                                                                                      |          |        |            |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------|------------|
| 11400Cft                                          | Coursed rubble masonry II sort in Cement mortar 1:4 including simultaneous pointing finish with cement mortar 1:3 including cost and conveyance of all materials except cement                                                                                                                                                       | 76-0-0   | 100Cft | 8664-0-0   |
| 2670Cft                                           | Vibrated reinforced cement concrete 1:2:4 with 3/4" B.S.S. hard granite metal using 4.0 lbs of steel per Cft of concrete including cost and conveyance of all materials except cement and steel and inclusive of cost of bending bars, tying grills, centering etc. complete for "Bed block" over piers and abutments                | 2-12-0   | Cft    | 7343-0-0   |
| 240Cft                                            | (a) Cement concrete 1:3:6 mix with 1 1/2" size B.S.S. hard granite metal including cost and conveyance of all materials except cement, but including placing centering, curing etc., complete for base course for approach slab                                                                                                      | 50-0-0   | 100Cft | 120-0-0    |
| 288Cft                                            | (b) Vibrated reinforced cement concrete 1:2:4 mix with 3/4" B.S.S. hard granite broken stone, excluding cost and conveyance of steel and cement but inclusive of cost and conveyance of all materials, cost of bending bars, tying grills, placing, centering, curing etc., complete for approach slabs                              | 3-4-0    | Cft    | 936-0-0    |
| 480Cft                                            | c) Rough stone dry packing with granite rough stone 1'-0" thick under base course for approach slab                                                                                                                                                                                                                                  | 37-0-0   | 100Cft | 178-0-0    |
| (data same as in sub-estimate for the approaches) |                                                                                                                                                                                                                                                                                                                                      |          |        |            |
| 27 Nos. 15.a)                                     | Providing roller bearings below 90'-0" span decking inclusive of cost of all materials and fixing in position complete                                                                                                                                                                                                               | 2000-0-0 | each   | 54000-0-0  |
| 27 Nos                                            | b) Providing fixed bearings with grout pad of cement mortar 1:1                                                                                                                                                                                                                                                                      | 50-0-0   | each   | 1350-0-0   |
| 42960Cft                                          | 16) Vibrated reinforced cement concrete 1:1 1/2:3 mix with 3/4" B.S.S. hard granite metal using 14.7 lbs of steel per Cft of concrete for Box girder decking and kerb including cost and conveyance of all materials except cement and steel and inclusive of cost of bending bars and welding tying grills centering etc., complete | 6-14-0   |        | 295350-0-0 |
| 270Rft                                            | 17) Providing expansion joints with copper plates 1/16" thick bent to bulb shape as shown in drawings with slots 4"x1 1/2" at 8" centres on either side including fixing at site and filling in bitumen                                                                                                                              | 10-0-0   | Rft    | 2700-00-0  |
| 90 Nos                                            | 18) Providing and fixing drainage spouts of light cast iron or concrete pipes 4" diameter including grouting at existence to pipes                                                                                                                                                                                                   | 30-0-0   | Each   | 2700-0-0   |
| 5360Cft                                           | 19) Vibrated cement concrete 1:1 1/2:3 mix with 65% of 1" size and 25% of 1/2" and 10% of 3/4" I.R.C. size hard granite metal including cost and conveyance of all materials except cement and inclusive of tamping finishing curing etc. complete for wearing coat.                                                                 | 100-00-0 | 100Cft | 5360-0-0   |

|           |                                                                                                                                                                                                                                                    |          |          |                    |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|--------------------|
| 1730 Rft  | 20) Reinforced cement concrete 1:2:4 with $\frac{1}{2}$ " B.S.S. metal for Hand Rails over the deck including cost and conveyance of all materials except cement and Steel and inclusive of bending bars, tying grills and centering etc. complete | 3-0-0    | Rft      | 5190-0-0           |
| 60 Cft    | 21) Cement concrete 1:2:4 with $\frac{1}{2}$ " B.S.S. hard granite metal including cost and conveyance of all materials except cement and inclusive of centering for coping over parapets                                                          | 76-0-0   | 100Cft   | 46-0-0             |
| 1380Tons  | 22) Supply of cement                                                                                                                                                                                                                               | 139-0-0  | Ton      | 191820-0-0         |
| 360Tons   | 23) Supply of steel                                                                                                                                                                                                                                | 635-0-0  | Ton      | 228600-0-0         |
| L.S.      | 24) Providing date stones                                                                                                                                                                                                                          |          |          | 1000-0-0           |
|           | 25) Acquisition charges                                                                                                                                                                                                                            |          |          |                    |
| 4.3 acres | a) Wet lands and gardens                                                                                                                                                                                                                           | 4000-0-0 | per acre | 17200-0-0          |
| 1 No.     | b) Tiled House                                                                                                                                                                                                                                     | 1500-0-0 | each     | 1500-0-0           |
|           | 26) Forming approach road(as per sub estimate                                                                                                                                                                                                      |          |          | 108200-0-0         |
|           | 27) Constructing a culvert on Hanga-lore side approach at chainage 3025 ft. as per sub estimate                                                                                                                                                    |          |          | 13450-0-0          |
|           | 28) Reconstructing the culvert at chainage 5420 on Udipi side approach road as per sub estimate                                                                                                                                                    |          |          | 8000-0-0           |
|           | 29) Constructing the culvert at chainage 5620 on the Udipi side approach road as per sub estimate                                                                                                                                                  |          |          | 9600-0-0           |
| 7 Nos     | 30) Providing temporary buildings for office and sheds for stacking materials plant and equipment                                                                                                                                                  | 4000-0-0 | each     | 28000-0-0          |
|           | 31) Contingencies                                                                                                                                                                                                                                  |          |          | 25053-0-0          |
|           | 32) Petty Supervision charges                                                                                                                                                                                                                      |          |          | 37579-0-0          |
|           |                                                                                                                                                                                                                                                    |          |          | <u>1317000-0-0</u> |

Approved for Rupees 13.17 lakhs only

(Sd) E.H. Nambiar,  
Chief Engineer (highways).

(TRUE COPY)

*[Signature]*  
TECHNICAL ASSISTANT TO  
CHIEF ENGINEER (HIGHWAYS)

*[Signature]*

# ESTIMATE - DETAILED MEASUREMENT SHEET

Name of work: Constructing a bridge across Udayavar at mile 33/5 of Mangalore  
Balindur Coast Road  
(Nine spans of 90'-0" clear)

| Details of work | Number | Measurement in feet |   |   | Area of or contents |
|-----------------|--------|---------------------|---|---|---------------------|
|                 |        | L                   | B | D |                     |

(1) Reinforced cement concrete 1:2:4 with 3/4" B.S.S. hard granite metal using 4.33 lbs of steel per cft including cost and conveyance of all materials except steel and cement and inclusive of cost of bending bars, tying grills, centering etc., complete for WELL CURBS.



Curbs for walls of abutments, piers and wings

|                                |    |                    |          |     |              |
|--------------------------------|----|--------------------|----------|-----|--------------|
| Top rectangular portion<br>(c) | 24 | (22x11-0)<br>7     | 2-0      | 0-6 | 630          |
| Rectangular portion (c)        | 24 | (22x12-6)<br>7     | 0-4      | 2-6 | 796          |
| Triangular portion<br>(c)      | 24 | (22x11-2 2/3)<br>7 | 1-6<br>2 | 2-6 | 1764         |
| Total                          |    |                    |          |     | 3190 or 3190 |

(2) Cement concrete 1:3:6 with 1 1/2" B.S.S. hard granite metal including cost and conveyance of all materials except cement and moulds placing, curing etc., for wall staining.

|                                  |   |             |     |       |                    |
|----------------------------------|---|-------------|-----|-------|--------------------|
| Left abutment<br>63.00 to 93.75  | 4 | 22/7 x 11-0 | 2-0 | 30.75 | 8905               |
| Pier No.1<br>21.00 to 94.00      | 2 | 22/7 x 11-0 | 2-0 | 43.00 | 5946               |
| Pier No.2<br>54.00 to 94.00      | 2 | 22/7 x 11-0 | 2-0 | 40.00 | 5531               |
| Pier No.3<br>51.00 to 94.00      | 2 | 22/7 x 11-0 | 2-0 | 43.00 | 5946               |
| Pier No.4<br>55.00 to 94.00      | 2 | 22/7 x 11-0 | 2-0 | 39.00 | 5393               |
| Pier No.5<br>51.00 to 94.00      | 2 | 22/7 x 11-0 | 2-0 | 43.00 | 5946               |
| Pier No.6<br>54.00 to 94.00      | 2 | 22/7 x 11-0 | 2-0 | 40.00 | 5531               |
| Pier No.7<br>63.00 to 94.00      | 2 | 22/7 x 11-0 | 2-0 | 31.00 | 4207               |
| Pier No.8<br>61.00 to 94.00      | 2 | 22/7 x 11-0 | 2-0 | 33.00 | 4563               |
| Right abutment<br>56.00 to 93.75 | 4 | 22/7 x 11-0 | 2-0 | 37.75 | 10441              |
| Total                            |   |             |     |       | 62100 or 62100 cft |

(3) Labour charges for all steel wrought and put up for ANGLE IRON CURTAIN EXPOSED below walls

|                             |    |                        |       |     |
|-----------------------------|----|------------------------|-------|-----|
| Cutting edges<br>4"x4"x1/2" | 24 | x22/7x 13-0x 12.75 lbs | 12502 | 5.6 |
|-----------------------------|----|------------------------|-------|-----|

4) Labour for bending and tying grills for BOND RODS AND RODS IN WELL STREINING

|                |      |       |         |       |
|----------------|------|-------|---------|-------|
| Bond rods 5/8" |      |       |         |       |
| Left abutment  | 4x15 | 33.75 | 2025.0  |       |
| Pier No.1      | 2x15 | 46.00 | 1380.0  |       |
| Pier No.2      | 2x15 | 43.00 | 1290.0  |       |
| Pier No.3      | 2x15 | 40.00 | 1380.00 |       |
| Pier No.4      | 2x15 | 42.00 | 1260.0  |       |
| Pier No.5      | 2x15 | 46.00 | 1380.0  |       |
| Pier No.6      | 2x15 | 43.00 | 1290.0  |       |
| Pier No.7      | 2x15 | 34.00 | 1020.0  |       |
| Pier No.8      | 2x15 | 36.00 | 1080.0  |       |
| Right abutment | 4x15 | 40.75 | 2445.0  | 15176 |
|                |      |       |         | 14550 |

# Hoops 3/8"

|                |      |      |              |
|----------------|------|------|--------------|
| Left abutment  | 4x31 | 36.0 | 4464'        |
| Pier No.1      | 2x43 | 36.0 | 3096'        |
| Pier No.2      | 2x40 | 36.0 | 2880'        |
| Pier No.3      | 2x40 | 36.0 | 3096'        |
| Pier No.4      | 2x39 | 36.0 | 2802'        |
| Pier No.5      | 2x43 | 36.0 | 3096'        |
| Pier No.6      | 2x40 | 36.0 | 2880'        |
| Pier No.7      | 2x31 | 36.0 | 2232'        |
| Pier No.8      | 2x33 | 36.0 | 2376'        |
| Right abutment | 4x38 | 36.0 | 5472'        |
|                |      |      | <u>32400</u> |

0.375 lbs 12150 lbs

|                 |       |
|-----------------|-------|
| Total           | 27326 |
| Add for wastage | 1366  |
| Binding wire    | 256   |

Grand Total 28948

12.92 Ton

(5) Binding cement concrete circular wells of 13'-0" outer diameter with 2ft thick standing through all soils of description including formation of islands and remaining islands etc., (depth reckoned from ordinary high tide level)

|                |   |       |                  |
|----------------|---|-------|------------------|
| Left abutment  |   |       |                  |
| 97.00 to 60.00 | 4 | 37.00 | 148              |
| Pier No.1      |   |       |                  |
| 97.00 to 48.00 | 2 | 49.00 | 98               |
| Pier No.2      |   |       |                  |
| 97.00 to 51.00 | 2 | 46.00 | 92               |
| Pier No.3      |   |       |                  |
| 97.00 to 48.00 | 2 | 49.00 | 98               |
| Pier No.4      |   |       |                  |
| 97.00 to 52.00 | 2 | 45.00 | 90               |
| Pier No.5      |   |       |                  |
| 97.00 to 48.00 | 2 | 49.00 | 98               |
| Pier No.6      | 2 | 46.00 | 92               |
| 97.00 to 51.00 |   |       |                  |
| Pier No.7      |   |       |                  |
| 97.00 to 60.00 | 2 | 37.00 | 74               |
| Pier No.8      |   |       |                  |
| 97.00 to 58.00 | 2 | 39.00 | 78               |
| Right abutment |   |       |                  |
| 97.00 to 53.00 | 4 | 44.00 | 176              |
|                |   |       | <u>9</u>         |
| Total          |   |       | 1044 or 1050 Rft |

(6) Providing and fixing dowel bars 1" diameter, 3'-9" inside bed rock and 3'-9" inside plugging excluding cost of steel but including drilling holes 2" diameter and grouting.

|                                       |       |         |
|---------------------------------------|-------|---------|
| Dowel bars in abutment and pier wells | 24x34 | 816     |
| Total                                 |       | 816 Nos |

(7) Cement concrete 1:2:4 with 1 1/2" B.S.S. hard granite metal including cost and conveyance of all materials except cement for BOTTOM PLUGGING inside wells either by bottom open bucket system or by Francis's method

|                                                           |    |                                                                 |     |                 |
|-----------------------------------------------------------|----|-----------------------------------------------------------------|-----|-----------------|
| Cylindrical portion(a)                                    | 24 | $22/7 \times \frac{9 \times 9}{4}$                              | 5-0 | 7637            |
| Triangular portion(b)                                     | 24 | $22/7 \times 10-1 \times \frac{1/3 \times 10-1 \times 10-1}{2}$ |     | 1988            |
| Extra for making up the unevenness in rock, starts if any |    |                                                                 |     | 275             |
| Total                                                     |    |                                                                 |     | <u>9500 cft</u> |

(8) Plugging wells with clean river sand.

|               |   |                                    |       |      |
|---------------|---|------------------------------------|-------|------|
| Left abutment | 4 | $22/7 \times \frac{9 \times 9}{4}$ | 26.75 | 6810 |
| Pier No.1     | 2 | $22/7 \times \frac{9 \times 9}{4}$ | 39.00 | 4964 |
| Pier No.2     | 2 | $22/7 \times \frac{9 \times 9}{4}$ | 36.00 | 4582 |
| Pier No.3     | 2 | $22/7 \times \frac{9 \times 9}{4}$ | 39.00 | 4964 |

|                |   |                                    |       |          |           |
|----------------|---|------------------------------------|-------|----------|-----------|
| (8) cont'd.    |   |                                    |       |          |           |
| Pier No. 4     | 2 | $22/7 \times \frac{9 \times 9}{4}$ | 35.00 | 4455     |           |
| Pier No. 5     | 2 | $22/7 \times \frac{9 \times 9}{4}$ | 39.00 | 4964     |           |
| Pier No. 6     | 3 | $22/7 \times \frac{9 \times 9}{4}$ | 36.00 | 4582     |           |
| Pier No. 7     | 2 | $22/7 \times \frac{9 \times 9}{4}$ | 27.00 | 3637     |           |
| Pier No. 8     | 2 | $22/7 \times \frac{9 \times 9}{4}$ | 29.00 | 3691     |           |
| Right abutment | 4 | $22/7 \times \frac{9 \times 9}{4}$ | 33.75 | 858      |           |
|                |   |                                    | Total | 51041 or | 51,000 ft |

(9) Cement concrete 1:4:8 with  $1\frac{1}{2}$ " B.S.S. hard granite metal including cost and conveyance of all materials except cement for TOP PLUGGING of wells.

|                        |    |                                    |     |      |         |
|------------------------|----|------------------------------------|-----|------|---------|
| For abutment and piers | 24 | $22/7 \times \frac{9 \times 9}{4}$ | 2.0 | 3952 | or 3060 |
|------------------------|----|------------------------------------|-----|------|---------|

(10) Vibrated reinforced cement concrete 1:2:4 with  $3/4$ " P.S.S. hard granite metal using 7.04 lbs of steel per cubic foot of concrete including cost and conveyance of all materials except steel and cement and inclusive of the cost of bending bars, welding them, tying grills, centering, baling water etc. complete for CASTING SLAB over wells.

|                     |                                                                |      |       |     |                  |
|---------------------|----------------------------------------------------------------|------|-------|-----|------------------|
| Over abutment wells | 2                                                              | 31-0 | 13-0  | 2-3 | 1814             |
| Over wing wells     | 2x2                                                            | 16-6 | 13-0  | 2-3 | 1931             |
| Over pier wells     |                                                                |      |       |     |                  |
| Straight portion    | 8                                                              | 18-0 | 13-0  | 2-0 | 3744             |
| Outwater portion    | $2 \times 8 \times \frac{22}{7} \times \frac{13 \times 13}{4}$ |      |       | 2-0 | 2125             |
|                     |                                                                |      | Total |     | 9414 or 9620 cft |

(11) Coursed rubble masonry first sort in cement mortar 1:4 including simultaneous pointing finish with cement mortar 1:3 including cost and conveyance of all materials except cement  
For piers 1 to 8

|                           |                                                                                 |      |       |      |                |
|---------------------------|---------------------------------------------------------------------------------|------|-------|------|----------------|
| Straight portion          | 8                                                                               | 21-0 | 6-0   | 7.04 | 7096           |
| Outwater portion          | $8 \times 2 \times \frac{1}{2} \times \frac{22}{7} \times \frac{5 \times 6}{4}$ |      |       | 7.04 | 1593           |
| Piers over abutment       | 4                                                                               | 3-0  | 3-0   | 12-0 | 432            |
| Wing wall parapets        | 4                                                                               | 16-0 | 1-6   | 2-0  | 192            |
| Extra for Pilaster at end | 4                                                                               | 2-0  | 0-3   | 2-0  |                |
|                           |                                                                                 |      | Total |      | 9317 or 932000 |

(12) Coursed rubble masonry second sort in cement mortar 1:4 including simultaneous pointing finish with cement mortar 1:3, including cost and conveyance of all materials except cement

|                               |                                                                                       |                   |                            |                     |        |
|-------------------------------|---------------------------------------------------------------------------------------|-------------------|----------------------------|---------------------|--------|
| Abutment:                     |                                                                                       |                   |                            |                     |        |
| First footing                 |                                                                                       |                   |                            |                     |        |
| 96.00 to 98.00                | 2                                                                                     | 31-0              | 10-0                       | 2-0                 | 1210   |
| 2nd footing                   |                                                                                       |                   |                            |                     |        |
| 98.00 to 99.00                | 2                                                                                     | 31-0              | $\frac{10+9}{2}$           | 1-0                 | 589    |
| from 99.0 to 103.04           |                                                                                       |                   |                            |                     |        |
| (a) Straight portion in front | 2                                                                                     | 21-0              | $\frac{4+3}{2}$            | 4.04                | 594    |
| (b) Outwater portion          | $2 \times 2 \times \frac{1}{2} \times \frac{22}{7} \times \frac{(8+6)^2}{2 \times 4}$ |                   |                            | 4.04                | 159    |
| (c) Rear portion              | 2                                                                                     | 31'-0"            | 5-0                        | 5.54                | 1717   |
| Back wall                     | 2                                                                                     | 24-0              | $\frac{5+2}{2}$            | 7.96                | 1336   |
| Side walls                    | 2x2                                                                                   | 5-0               | 3-6                        | 8.21                | 575    |
| Wing wall                     | 2x2                                                                                   | 14-0              | $\frac{8+1\frac{1}{2}}{2}$ | 16.50               | 4389   |
| Wing front offset             | 2x2                                                                                   | 14-0              | 1-0                        | $\frac{2+3}{2}$     | 140    |
| Wing front batter             | 2x2                                                                                   | 14-0              | 1-0                        | $\frac{3+16.50}{2}$ | 546    |
| Cornices:                     |                                                                                       |                   |                            |                     |        |
| Reveal portion                | 2x2                                                                                   | 22-6              | 0-3                        | 1-0                 | 23     |
| approach                      | 2x2                                                                                   | 3-1 $\frac{1}{2}$ | $\frac{3-0}{2}$            | $\frac{8.21}{3}$    | 51     |
| Deduct for approach slab      | 2                                                                                     | 24'-0"            | 21-0"                      | 01'-6"              | 42 111 |

(13) Vibrated reinforced cement concrete 1:2:4 with 3/4" B.S.S. hard granite metal using 4.0 lbs of steel per Cft. of concrete including cost and conveyance of all materials except steel and cement and inclusive of cost of bending bars, tying grills, centering etc., complete for BED BLOCKS over piers and abutments

|                          |   |      |                                                  |        |                  |
|--------------------------|---|------|--------------------------------------------------|--------|------------------|
| Over abutments           |   |      |                                                  |        |                  |
| Straight portion         | 2 | 21-0 | 3-3                                              | 1-6    | 205              |
| Out water bottom portion | 2 | 22-7 | $\frac{6.5^2}{4}$                                | 1-0    | 33               |
| Outwater top portion     | 2 | 2    | $\frac{1}{2} \times 22/7 \times \frac{6.5^2}{4}$ | 0-2    | 6                |
| Extra for fixed end      | 1 | 21-0 | 3-0                                              | (1-10) | 53               |
| Over piers               |   |      |                                                  |        |                  |
| Straight portion         | 8 | 21-0 | 6-0                                              | 1-6    | 1638             |
| Outwater bottom portion  | 8 | 2    | $\frac{1}{2} \times 22/7 \times \frac{6.5^2}{4}$ | 1-0    | 266              |
| Outwater top portion     | 8 | 2    | $\frac{1}{2} \times 22/7 \times \frac{6.5^2}{4}$ | 0-2    | 44               |
| Extra for fixed ends     | 4 | 21-0 | 6-0                                              | 0-10   | 420              |
| Total                    |   |      |                                                  |        | 2665 or 2670 cft |

14) Cement concrete 1:3:6 mix with 1 1/2" size B.S.S. hard granite broken stone including cost and conveyance of all materials except cement but including placing centering complete

Base course for R.C. approach

slab 2 10-0 24-0 0-6 210 cft

b) Vibrated reinforced cement concrete 1:2:4 mix with 3/4" B.S.S. hard granite broken stone, excluding cost and conveyance of steel and cement but inclusive of cost and conveyance of all materials cost of bending bars, tying grills, placing centering, curing etc., complete for approach slabs

2 12-0 24-0 0-6 288 cft

c) Rough stone dry packing with granite rough stones 1'-0" thick under the base course for approach slab

2 10-0 24-0 1-0 480 cft

15)a) Providing roller bearings below 90'-0" decking inclusive of cost of all materials and fixing in position complete.

For nine spans 9 x 3. 27 Nos

15)b) Providing fixed bearings with grout bed of cement mortar 1:1

For nine spans 9 9 lbs

16) Vibrated reinforced cement concrete 1:1 1/2:3 mix with 3/4" B.S.S. hard granite metal using 14.7 lbs of steel per cubic foot of concrete for box girder inclusive of cost and conveyance of all materials except cement and steel and inclusive of cost and bending bars and welding, tying grills, centering, etc., complete

|                                |           |         |                 |                      |       |
|--------------------------------|-----------|---------|-----------------|----------------------|-------|
| Bottom slab                    | 9         | 96-0    | 19-0            | 0-6                  | 8280  |
| Top slab                       | 9         | 96-0    | 19-0            | 0-9                  | 12312 |
| Cantilever portion of top slab | 9x2       | 96-0    | 3-9             | $\frac{0-10-0-0}{2}$ | 1220  |
| Kerbs                          | 9x2       | 96-0    | 1-3             | 1-0                  | 2160  |
| Webs                           | 9x3       | 96-0    | 0-9             | 5-9                  | 11178 |
| Top fillets                    | 9x4       | 96-0    | 1-3             | $\frac{0-6}{2}$      | 1080  |
| Bottom fillets                 | 9x4       | 96-0    | 0-8             | $\frac{0-4}{2}$      | 384   |
| Intermediate diaphragm         | 9 x 2 x 4 | 8-4 1/2 | 0-10            | 5-9                  | 2889  |
| Fillets in diaphragm holes     | 9x2x2x2   | 0-4     | $\frac{0-4}{2}$ | 0-10                 | 13    |
| End diaphragm                  | 9x2x2     | 8-4 1/2 | 1-0             | 5-9                  | 1733  |
| Fillets in diaphragm hole      | 9x2x2     | 0-4     | $\frac{0-4}{2}$ | 1-0                  | 8     |
| Total                          |           |         |                 |                      | 44285 |

|                                                                                                                                                                                                                                                                |                      |                 |      |                 |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------|------|-----------------|------------------|
| Reinforcement for                                                                                                                                                                                                                                              |                      |                 |      |                 |                  |
| Openings in intermediate diaphragm                                                                                                                                                                                                                             | 9x2x4                | 4-0             | 3-0  | 0-10            | 728              |
| Openings in end diaphragm                                                                                                                                                                                                                                      | 9x2x2                | 4-0             | 3-0  | 1-0             | 432 432          |
| Pillots in main girder covered by end diaphragm top                                                                                                                                                                                                            | 9x4x2                | 1-0             | 1-3  | $\frac{0-6}{2}$ | 23               |
| Pillots in main girder covered by end diaphragm bottom                                                                                                                                                                                                         | 9x4x2                | 1-0             | 0-8  | $\frac{0-4}{2}$ | 8                |
| -do- intermediate diaphragm top                                                                                                                                                                                                                                | 9x4x2                | 0-10            | 1-3  | $\frac{0-6}{2}$ | 36               |
| -do- -do- bottom                                                                                                                                                                                                                                               | 9x4x2                | 0-10            | 0-8  | $\frac{0-4}{2}$ | 13               |
| Curved portion of curb                                                                                                                                                                                                                                         | 9x2                  | 96-0 x 0.054    |      |                 | 93               |
|                                                                                                                                                                                                                                                                |                      | total deduction |      |                 | 1327             |
|                                                                                                                                                                                                                                                                |                      | 44,235 - 1327   |      |                 | 42908 or         |
|                                                                                                                                                                                                                                                                |                      | Net total       |      |                 | 42,960 cft       |
| 17) Providing connection joints with copper plates 1/16" thick bent to bull shape as shown in drawings with slots 4" x 1 1/2" at 8" centres on either side including fixing at site and filling in bitumen                                                     |                      |                 |      |                 |                  |
| Joints between slabs                                                                                                                                                                                                                                           | 10                   | 26-6            |      |                 | 265 or 270 sq    |
| 18) Providing and fixing drainage spouts of light cast iron or concrete pipes 4" diameter including grating at entrance to pipes                                                                                                                               |                      |                 |      |                 |                  |
| Pipes                                                                                                                                                                                                                                                          | 2 x 9 x 5            |                 |      |                 | 90 Nos.          |
| 19) Vibrated cement concrete 1:1 1/2:3 mix with 65% of 1" size and 25% of 1/2" size and 10% of 3/4" size hard granite metal including cost and conveyance of all materials except and inclusive of tamping, finishing, curing etc., complete for MARRING CO-41 |                      |                 |      |                 |                  |
| earing coat over                                                                                                                                                                                                                                               |                      |                 |      |                 |                  |
| deck slab                                                                                                                                                                                                                                                      | 9                    | 96-0            | 24-0 | 0-3             | 5184             |
| Over backing wall                                                                                                                                                                                                                                              | 2                    | 24-0            | 2-0  | 0-3             | 24               |
| Over approach slabs                                                                                                                                                                                                                                            | 2                    | 12-0            | 24-0 | 0-3             | 144              |
|                                                                                                                                                                                                                                                                |                      |                 |      | Total           | 5352 or 5360 cft |
| 20) Reinforced cement concrete 1:2:4 with 1/2" B.S.S. metal for HAND RAILS OVER THE CURB including cost and conveyance of all materials except and inclusive of bending bars, tying, grills and centering etc., complete                                       |                      |                 |      |                 |                  |
| Over deck                                                                                                                                                                                                                                                      | 2x9                  | 96-0            |      |                 | 1728 or 1730 sq  |
| 21) Cement concrete 1:2:4 with 1/2" B.S.S. hard granite metal including cost and conveyance of all materials except cement and inclusive of centering for COPING over parapets                                                                                 |                      |                 |      |                 |                  |
| Coping over parapet walls                                                                                                                                                                                                                                      | 2x2                  | 16-0            | 1-9  | 0-6             | 35               |
| Extra for pillar portion                                                                                                                                                                                                                                       | 2x2                  | 4-0             | 0-3  | 0-6             | 2                |
|                                                                                                                                                                                                                                                                |                      |                 |      | Total           | 37 or 40 cft     |
| 22) Supply of cement                                                                                                                                                                                                                                           |                      |                 |      |                 |                  |
| i) for wall curb concrete                                                                                                                                                                                                                                      | 3600 x 24/100        |                 |      |                 | 816              |
| ii) for wall staining concrete                                                                                                                                                                                                                                 | 62100 x 16 2/3 / 100 |                 |      |                 | 10350            |
| iii) for bottom plugging concrete                                                                                                                                                                                                                              | 9500 x 25/100        |                 |      |                 | 2375             |
| iv) for top plugging concrete                                                                                                                                                                                                                                  | 3060 x 12 1/2 / 100  |                 |      |                 | 383              |
| v) coping slab concrete                                                                                                                                                                                                                                        | 9620 x 24/100        |                 |      |                 | 2309             |
| vi) masonry 1st sort                                                                                                                                                                                                                                           | 9320 x 28 1/4 / 100  |                 |      |                 | 652              |
| vii) masonry 2nd sort                                                                                                                                                                                                                                          | 11400 x 32 1/4 / 100 |                 |      |                 | 334 912          |
| viii) red brick concrete                                                                                                                                                                                                                                       | 2670 x 24/100        |                 |      |                 | 641              |
| ix) decking concrete                                                                                                                                                                                                                                           | 42960 x 32/100       |                 |      |                 | 13747            |
| x) wearing coat concrete                                                                                                                                                                                                                                       | 5360 x 3 1/3 / 100   |                 |      |                 | 1787             |
| xi) Hand rails concrete                                                                                                                                                                                                                                        | 1730 x 0.56 x 24/100 |                 |      |                 | 233              |
| xii) coping concrete                                                                                                                                                                                                                                           | 60 x 25/100          |                 |      |                 | 15               |
| xiii) coarse course for approach slabs                                                                                                                                                                                                                         | 240x1/6              |                 |      |                 | 40               |
| xiv) Approach slab                                                                                                                                                                                                                                             | 288x24/100           |                 |      |                 | 69               |
| Extra for grouting etc.,                                                                                                                                                                                                                                       |                      |                 |      |                 | 105 34434        |
| or 1376 tons 34434 or 1377.4 or 1380 Tons                                                                                                                                                                                                                      |                      |                 |      |                 |                  |

|                                                     |                   |                  |
|-----------------------------------------------------|-------------------|------------------|
| 23) Supply of steel                                 |                   |                  |
| (i) Curb reinforcement as per schedule              | 24 x 615 lbs      | 14760            |
| (ii) Cutting, edges as in item 3                    |                   | 12502            |
| (iii) Bond and hoops rows in retaining as in item 4 |                   | 28948            |
| (iv) Lateral bars                                   | 24x34x7½ x 2.670  | 16340            |
| v) Clipping slab                                    |                   |                  |
| a) Over abutment wells as per schedule              | 9620 x 7.44       | 71573            |
| b) Over pier wells as per schedule                  |                   |                  |
| vi) Red blocks as per schedule                      | 2670 x 4.0        | 10680            |
| vii) Box girder as per schedule                     | 9 x 70.000 lbs    | 630000           |
| viii) Hand rails as per schedule                    | 1730 x 5.73       | 9923             |
| ix) Approach slab as per schedule                   | 288 x 11.68       | 3421             |
|                                                     |                   | <u>798137</u> lb |
|                                                     | 356.2 or 360 Tons |                  |

24) Providing data alone L.S.

#### 25) Acquisition charges

##### (a) Wet lands and gardens Mangalore side

|                  |   |       |       |       |
|------------------|---|-------|-------|-------|
| From chainage to |   |       |       |       |
| 2600 to 2900     | 1 | 300-0 | 100-0 | 30000 |
| From chainage    |   |       |       |       |
| 2900 to 3000     | 1 | 100-0 | 66-0  | 6600  |
| From chainage    |   |       |       |       |
| 3000 to 3300     | 1 | 300-0 | 100-0 | 30000 |
| Island portion   | 1 | 60-0  | 100-0 | 6000  |

##### Udipi side

|                |   |       |       |       |
|----------------|---|-------|-------|-------|
| From chainage  |   |       |       |       |
| 4150 to 4400   | 1 | 242-0 | 100-0 | 24200 |
| From chainage  |   |       |       |       |
| 4400 to 4500   | 1 | 100-0 | 66-0  | 6600  |
| From chainage  |   |       |       |       |
| 4500 to 5100   | 1 | 600-0 | 100-0 | 60000 |
| From chainage. |   |       |       |       |
| 5100 to 5650   | 1 | 550-0 | 40-0  | 22000 |

Total 158400 4.226  
or 4.5 acres

##### (b) Houses Tiled House

1 No.

26) Forming approach road - as per sub estimate

27) Constructing a culvert on Mangalore side approach at chainage 3025 as per sub-estimate

28) Reconstructing the culvert at chainage 5420 on Udipi side approach as per sub estimate

29) Reconstructing the culvert at chainage 5620 on Udipi side approach as per sub estimate

30) Providing temporary buildings for office and sheds for storing materials, plant and equipment

|                    |   |   |
|--------------------|---|---|
| (i) Office         | 1 | 1 |
| (ii) Cement Stores | 2 | 2 |

|                       |         |
|-----------------------|---------|
| 31) Contingencies     | 2% L.S. |
| 32) Petty supervision | 2% L.S. |

|                       |   |
|-----------------------|---|
| 33) Shed store 1      | 1 |
| 34) Shed for plants 2 | 2 |
| 35) Inspection Shed 1 | 1 |

Total

7 7 Nos

2/3/5/2/5/

Name of work: Constructing a bridge across Udayavar River at mile 23/5 of Mangalore  
Balindur Coast Road

| Quantity | Description of work | Rate | Per | Amount |
|----------|---------------------|------|-----|--------|
|----------|---------------------|------|-----|--------|

1. a) Vibrated Cement concrete 1:2:4 with 3/4" B.S.S. hard granite metal for BALINDUR COAST ROAD work including cost and conveyance of all materials except cement and steel per Cft

Quantities for 100 Cft

|         |                                               |        |        |               |
|---------|-----------------------------------------------|--------|--------|---------------|
| 96 Cft  | 3/4" B.S.S. metal                             | 42-0-0 | 100Cft | 40-5-2        |
| 48 Cft  | Sand                                          | 2-8-0  | "      | 1-5-2         |
| 1 No.   | Mason 2nd class                               | 2-12-0 | each   | 2-12-0        |
| 6 Nos.  | Men Mazdoors                                  | 1-8-0  | "      | 9-0-0         |
| 10 Nos. | Women Mazdoors                                | 0-12-0 | "      | 7-8-0         |
| 96 Cft  | Conveyance of metal 1 1/2 miles metalled road | 9-6-0  | 100Cft | 9-0-0         |
| L.S.    | Rehandling materials in river bed             |        |        | 11-0-0        |
| L.S.    | Add for vibrated concrete work                |        |        | 15-0-0        |
|         | Sundries                                      |        |        | 8-1-0         |
|         | <b>Total</b>                                  |        |        | <b>96-0-0</b> |

Rate per Cft  $\frac{96-0-0}{100} = 0-15-4$

b) Cement concrete 1:2:4 with 3/4" B.S.S. hard granite metal for reinforced concrete work including cost and conveyance of all materials except cement and steel per Cft

|                       |              |        |                |
|-----------------------|--------------|--------|----------------|
| in per item 1 (a)     | 96-0-0       | 100Cft | 96-0-0         |
| Reinforcement charges | 15-0-0       | "      | 15-0-0         |
|                       | <b>Total</b> |        | <b>111-0-0</b> |

Rate per Cft  $\frac{111-0-0}{100}$

0-13-0

2. Reinforced concrete 1:2:4 with 3/4" B.S.S. hard granite metal using 4.35 lbs of steel per Cft of concrete including cost and conveyance of all materials except steel and cement and inclusive of cost of bending bars, tying grills, centering etc. complete for WALL CURB - per Cft

|          |                               |        |     |              |
|----------|-------------------------------|--------|-----|--------------|
| 1 Cft    | Cement concrete for R.C. work | 0-13-0 | Cft | 0-13-0       |
| 4.35 lbs | Tying grills                  | 7-0-0  | Cft | 0-1-0        |
| 1 Cft    | Centering                     | 1-0-0  | Cft | 1-0-0        |
| L.S.     | Sundries                      |        |     | 0-0-0        |
|          | <b>Total</b>                  |        |     | <b>2-2-0</b> |

(3) Cement concrete 1:2:6 with 1 1/4" B.S.S. hard granite metal including cost and conveyance of all materials except cement and inclusive of cost of moulds, cleaning, curing etc., complete for WALL STRAINING - per 100 Cft

|        |                                   |        |        |               |
|--------|-----------------------------------|--------|--------|---------------|
| 100Cft | 1 1/4" B.S.S. metal               | 23-0-0 | 100Cft | 23-0-0        |
| 50 Cft | Sand                              | 2-8-0  | "      | 1-5-2         |
| 2 No.  | Mason - II class                  | 2-12-0 | each   | 1-8-0         |
| 5 Nos. | Men Mazdoors                      | 1-8-0  | "      | 7-8-0         |
| 4 Nos. | Women Mazdoors                    | 0-12-0 | "      | 3-0-0         |
| 100Cft | Water carted 1 1/2 miles          | 9-6-0  | 100Cft | 9-6-0         |
| L.S.   | Rehandling materials in river bed |        |        | 7-8-0         |
| L.S.   | Shuttering charges                |        |        | 30-0-0        |
|        | Sundries                          |        |        | 0-0-0         |
|        | <b>Total</b>                      |        |        | <b>83-0-0</b> |

(4) Providing and fixing dowel bars 1" dia 9'-9" inside bed rock and 3'-9" inside pluging-excluding cost of steel but including drilling holes 2" diameter and grouting - each

|           |                                   |       |     |               |
|-----------|-----------------------------------|-------|-----|---------------|
| 3 3/4 Cft | Drilling holes 2" dia in bed rock | 1-8-0 | Hft | 5-10-0        |
| L.S.      | Grouting around bars              |       |     | 2-0-0         |
| L.S.      | Add for under water work          |       |     | 2-0-0         |
|           | <b>Total</b>                      |       |     | <b>9-10-0</b> |

(5) Cement concrete 1:2:4 with 1½" B.S.S. hard granite metal including cost and conveyance of all materials except cement for BOTTOM PLASTERING inside walls either by bottom open bucket system or Tremie method - per 100 Cft

|         |                                                        |        |         |        |
|---------|--------------------------------------------------------|--------|---------|--------|
| 1000ft  | 1½" B.S.S. metal                                       | 23-0-0 | 1000ft  | 23-0-0 |
| 50 Cft  | Sand                                                   | 2-8-0  | "       | 1-4-0  |
| 1/2 cu. | lason 2d class                                         | 2-12-0 | dash    | 1-0-0  |
| 5 Nos.  | Men mazdoors                                           | 1-8-0  | "       | 7-0-0  |
| 4 Nos.  | Women mazdoors                                         | 0-12-0 | each    | 3-0-0  |
| 100 Cft | metal carted 1½ mile                                   | 9-6-0  | 100 Cft | 9-6-0  |
| L.L.    | Extra for laying concrete under water by Tremie method |        |         | 15-0-0 |
| L.L.    | Rehandling materials in river bed                      |        |         | 7-0-0  |
|         | Sundries                                               |        |         | 0-2-0  |
|         |                                                        |        | Total   | 60-0-0 |

(6) Laying walls with clean river sand - per 100 Cft

|         |                                                         |       |        |       |
|---------|---------------------------------------------------------|-------|--------|-------|
| 100 Cft | Sand                                                    | 1-0-0 | 1000ft | 1-0-0 |
| L.L.    | Extra for getting into well and consolidation in layers |       |        | 1-0-0 |
|         |                                                         |       |        | 2-0-0 |

(7) Cement concrete 1:2:4 with 1½" B.S.S. hard granite metal including cost and conveyance of all materials except cement for TOP PLASTERING OF WALLS per 100 Cft

|         |                                   |        |        |        |
|---------|-----------------------------------|--------|--------|--------|
| 1000ft  | 1½" B.S.S. metal                  | 23-0-0 | 1000ft | 23-0-0 |
| 500ft   | Sand                              | 2-8-0  | "      | 1-4-0  |
| 1/2 cu. | lason 2d class                    | 2-12-0 | each   | 1-0-0  |
| 5 Nos.  | Men mazdoors                      | 1-8-0  | "      | 7-0-0  |
| 4 Nos.  | Women mazdoors                    | 0-12-0 | "      | 3-0-0  |
| 100 Cft | metal carted 1½ miles             | 9-6-0  | 1000ft | 9-6-0  |
| L.L.    | Rehandling materials in river bed |        |        | 7-0-0  |
|         | Sundries                          |        |        | 0-2-0  |
|         |                                   |        | Total  | 59-0-0 |

(8) Vibrated reinforced cement concrete 1:2:4 with 3/4" B.S.S. hard granite metal using 7.44 lbs of steel per Cft of concrete including cost and conveyance of all materials except cement and steel and inclusive of the cost of banding bars holding them tying grids, carting, baling water etc., complete for CARPETING SLAB over walls - per Cft

|          |                                    |         |       |            |
|----------|------------------------------------|---------|-------|------------|
| 1 Cft    | C.C. for S.O.S. work               | 0-15-4  | Cft   | 0-35-4     |
| 7.44 lbs | Tying grids                        | 7-00-00 | Cwt   | 0-7-5      |
|          | 200.111 = 12.22                    |         |       |            |
|          | 9 x 7.77 = 62.13                   |         |       |            |
|          | 74.33 = 7.44/Cft                   |         |       |            |
| L.L.     | Soldering 1" steel rods            |         |       | 0-0-0      |
| L.L.     | Centering                          |         |       | 1-0-0      |
| L.L.     | Baling water, cofferdam works etc. |         |       | 0-0-0      |
|          | Sundries                           |         |       | 0-1-0      |
|          |                                    |         | Total | Rs. 1-4-10 |

(9) Coursed rubble masonry first sort in cement mortar 1:4 including simultaneous pointing finish with cement mortar 1:3 including cost and conveyance of all materials except cement - per 100 Cft

|         |                                            |        |         |         |
|---------|--------------------------------------------|--------|---------|---------|
| 110 cu. | C. stones 1st sort (including band stones) | 12-0-0 | 1000ft  | 12-12-0 |
| 28 Cft  | Sand                                       | 2-8-0  | "       | 0-11-0  |
| 10 Nos. | lason 2nd class                            | 2-12-0 | each    | 27-0-0  |
| 4 Nos.  | Men mazdoors                               | 1-8-0  | "       | 6-0-0   |
| 4 Nos.  | Women mazdoors                             | 0-12-0 | "       | 3-0-0   |
| 28 Cft  | Placing mortar                             | 4-8-0  | 100 Cft | 1-4-0   |
| L.L.    | Pointing with cement mortar                |        |         | 2-0-0   |
| L.L.    | Scaffolding charges                        |        |         | 2-0-0   |
| 110 cu. | C.S. stones carted 1½ miles                | 9-6-0  | 1000ft  | 10-0-0  |
| L.L.    | Extra for handling materials in river bed  |        |         | 7-0-0   |
|         | Sundries                                   |        |         | 0-4-0   |
|         |                                            |        | Total   | 102-0-0 |

10) Coursed rubble masonry 2nd sort in cement mortar 1:4 including simultaneous pointing finish with cement mortar 1:3 including cost and conveyance of all materials except cement - per 100 Cft

|         |                                         |        |        |         |
|---------|-----------------------------------------|--------|--------|---------|
| 110 Cft | C.C. stones 2nd sort including:         |        |        |         |
|         | bond stones                             | 28-0-0 | 100Cft | 30-12-0 |
| 32 Cft  | Sand                                    | 2-8-0  | "      | 0-22-0  |
| 7 Cft   | Mason II class                          | 2-12-0 | each   | 19-0-0  |
| 4 Cft   | Men Harddoors                           | 1-8-0  | "      | 6-0-0   |
| 4 Cft   | Women Harddoors                         | 0-12-0 | "      | 3-0-0   |
| 32 Cft  | Working mortar                          | 4-8-0  | 100Cft | 1-7-0   |
| L.S.    | Pointing with cement mortar             |        |        | 2-0-0   |
| L.S.    | Scaffolding charges                     |        |        | 2-0-0   |
| 110 Cft | C.C. stones carted $1\frac{1}{2}$ miles | 9-6-0  | 100Cft | 10-5-0  |
|         | Lundries                                |        |        | 0-0-0   |
|         | Total                                   |        |        | 70-0-0  |

11) Vibrated reinforced cement concrete 1:2:4 with  $\frac{3}{4}$ " B.S.S. hard granite metal using 4.0 lbs of steel per Cft of concrete including cost and conveyance of all materials except steel and cement and inclusive of cost of bending bars, tying grills, centering etc., complete for BED BLOCKS per Cft

|       |                      |        |     |        |
|-------|----------------------|--------|-----|--------|
| 1 Cft | C.C. for R.C.C. work | 0-15-4 | Cft | 0-15-4 |
| 4 lbs | Tying grills         | 7-0-0  | Cwt | 0-1-0  |
| L.S.  | Centering charges    |        |     | 1-0-0  |
| L.S.  | Lundries             |        |     | 0-0-0  |
|       | Total                |        |     | 2-1-4  |

12) Vibrated reinforced cement concrete 1:2:3 mix with  $\frac{3}{4}$ " B.S.S. hard granite metal using 14.7 lbs of steel per Cft of concrete for BOX GIRDER BRACING and B.M., including cost and conveyance of all materials except cement and steel and inclusive of cost of bending bars and welding, tying grills, centering etc., complete - per Cft

|           |                      |        |     |        |
|-----------|----------------------|--------|-----|--------|
| 1 Cft     | C.C. for R.C.C. work | 0-15-4 | Cft | 0-15-4 |
| 7 1/2 Cft | Tying grills         | 7-0-0  | Cwt | 0-21-0 |
| L.S.      | Welding bars         |        |     | 0-0-0  |
| L.S.      | Centering            |        |     | 4-0-0  |
|           | Total                |        |     | 6-36-4 |

13) Vibrated cement concrete 1:1:3 with 65% of 1" size and 35% of  $\frac{1}{2}$ " size and 10% of  $\frac{3}{4}$ " B.S.S. hard granite metal including cost and conveyance of all materials except cement and including tamping, finishing curing etc., complete for BEAMING COAT - per 100 Cft

|        |                                       |         |        |         |
|--------|---------------------------------------|---------|--------|---------|
| 65 Cft | 1" size metal I.S.C.                  | 30-0-0  | 100Cft | 19-0-0  |
| 25 Cft | $\frac{1}{2}$ " size metal I.S.C.     | 55-00-0 | "      | 13-12-0 |
| 10 Cft | $\frac{3}{4}$ " size metal I.S.C.     | 70-0-0  | "      | 7-0-0   |
| 50 Cft | Sand                                  | 2-0-0   | "      | 1-0-0   |
| 1 Cft  | Mason first class                     | 2-0-0   | each   | 3-0-0   |
| 6 Cft  | Men Harddoors                         | 1-8-0   | "      | 9-0-0   |
| 12 Cft | Women Harddoors                       | 0-12-0  | "      | 7-0-0   |
| 2 Cft  | Mason of class for finishing          | 2-12-0  | "      | 6-0-0   |
| L.S.   | Add for vibrated concrete work        |         |        | 15-0-0  |
|        | Add for handling materials in low bed |         |        | 6-0-0   |
| 10 Cft | metal carted $1\frac{1}{2}$ miles     | 9-6-0   | 100Cft | 9-6-0   |
|        | Lundries                              |         |        | 0-0-0   |
|        | Total                                 |         |        | 100-0-0 |

14) Vibrated reinforced cement concrete 1:2:4 with  $\frac{1}{2}$ " B.S.S. hard granite metal for HANDRAILS over the deck including cost and conveyance of all materials except cement and steel and inclusive of the cost of bending bars, tying grills centering etc., complete per Cft

|          |                                         |               |     |        |
|----------|-----------------------------------------|---------------|-----|--------|
|          | Rate for cement concrete for            |               |     |        |
|          | R.C.C. work with $\frac{3}{4}$ " metal  |               |     | 0-15-4 |
|          | per Cft                                 |               |     |        |
|          | Add for difference in rate for          |               |     |        |
|          | $\frac{3}{4}$ " & $\frac{1}{2}$ " metal | 13 x 0.96/100 |     | 0-0-2  |
|          | Total                                   |               |     | 1-1-2  |
| 0.5 Cft  | C.C. for R.C.C. work                    | 1-1-4         | Cft | 0-0-0  |
| 5.73 lbs | Tying grills                            | 7-0-0         | Cwt | 3-0-0  |
| L.S.     | Centering                               |               |     | 2-0-0  |
|          | Lundries                                |               |     | 0-0-0  |
|          | Total                                   |               |     | 3-0-2  |

15) Cement concrete 1:3:6 mix with 1½" size H.B.S. hard granite stones including cost and conveyance of all materials except cement, but including placing, centering, curing etc. for base course for approach slab

|         |                               |        |        |          |
|---------|-------------------------------|--------|--------|----------|
| 100 cft | Broken stone 1½" H.B.S.       | 23-0-0 | 100cft | 23-0-0   |
| 5 cft   | Sand                          | 2-8-0  | "      | 1-4-0    |
| 5 cft   | Mixing mortar                 | 4-8-0  | "      | 2-4-0    |
| 2 nos.  | Mason II class                | 2-12-0 | each   | 1-6-0    |
| 5 nos.  | Men mazdoor                   | 1-8-0  | "      | 7-4-0    |
| 4 nos.  | Women mazdoor                 | 0-12-0 | each   | 3-0-0    |
| 10 cft  | Lead for metal coated 1½ mild | 9-6-0  | 100cft | 9-6-0    |
| 10 cft  | Centering shuttering etc.,    |        |        | 2-4-0    |
|         |                               |        |        | 50-0-0   |
|         |                               |        |        | /100 cft |

16) Vibrated reinforced cement concrete 1:2:4 mix with 2/17" H.B.S. hard granite broken stone using 11.88 lbs of steel per Cft of concrete including cost of steel and cement but inclusive of cost of bending bars, tying grills, centering etc., complete for approach slabs

|           |                        |        |       |         |
|-----------|------------------------|--------|-------|---------|
| 1 cft     | C.C. for concrete work | 0-13-4 | 1 cft | 0-13-4  |
| 11.88 lbs | Tying grills           | 7-0-0  | 1 cft | 0-11-11 |
| 10 cft    | Centering charges      |        |       | 1-0-0   |
| 10 cft    | Sundries               |        |       | 0-0-0   |
|           |                        |        |       | 1-11-11 |

17) Cement concrete 1:2:4 with 1½" H.B.S. hard granite metal including cost and conveyance of all materials except cement and inclusive of centering for C/PING over parapets - per 100 Cft

|         |                     |        |         |        |
|---------|---------------------|--------|---------|--------|
| 100 cft | 1½" H.B.S. metal    | 23-0-0 | 100 cft | 23-0-0 |
| 500cft  | Sand                | 2-8-0  | "       | 1-4-0  |
| 2 nos.  | Mason II class      | 2-12-0 | each    | 1-6-0  |
| 5 nos.  | Men mazdoors        | 1-8-0  | "       | 7-4-0  |
| 4 nos.  | Women mazdoors      | 0-12-0 | each    | 3-0-0  |
| 10 cft  | Lead coated 1½ mild | 9-6-0  | 100cft  | 9-6-0  |
| 10 cft  | Centering charges   |        |         | 30-0-0 |
|         | Sundries            |        |         | 0-0-0  |
|         |                     |        |         | 76-0-0 |
|         |                     |        |         | Total  |

|                                |                                                                     |          |        |         |
|--------------------------------|---------------------------------------------------------------------|----------|--------|---------|
| 18) Supply of cement - per ton |                                                                     |          |        |         |
| 1 ton                          | Cement L.S.D. rate                                                  | 72-0-0   | ton    | 72-0-0  |
|                                | Inspection charges 2%                                               |          |        | 1-7-0   |
|                                | Sales tax at 0-0-3 per Re                                           |          |        | 1-2-0   |
|                                | Storage charges                                                     |          |        | 2-0-0   |
|                                | Loading and unloading charges                                       |          |        | 2-0-0   |
|                                | Railway freight from Madhukarai to Bangalore                        |          |        | 15-1-0  |
| 20 cft                         | Conveyance from Bangalore to bridge site via 100 1/2 miles by lorry | 136-12-6 | 100cft | 32-13-3 |
| 10 cft                         | Rehandling cement for work in river bed                             |          |        | 2-0-0   |
|                                | Fluctuation in L.S.D. rate                                          |          |        | 10-0-0  |
|                                | Sundries                                                            |          |        | 0-0-0   |
|                                |                                                                     |          |        | 139-0-0 |
|                                |                                                                     |          |        | Total   |

|                               |                                                                     |         |         |         |
|-------------------------------|---------------------------------------------------------------------|---------|---------|---------|
| 19) Supply of steel - per ton |                                                                     |         |         |         |
| 1 ton                         | Steel L.S.D. rate                                                   | 480-0-0 | ton     | 480-0-0 |
|                               | Inspection charges 2%                                               |         |         | 9-9-0   |
|                               | Sales tax at 0-0-3 per Re                                           |         |         | 7-0-0   |
|                               | Storage charges                                                     |         |         | 2-0-0   |
|                               | Loading and unloading charges                                       |         |         | 2-0-0   |
|                               | Railway freight from Madras                                         |         |         | 47-0-0  |
|                               | Conveyance from Bangalore to bridge site via 100 1/2 miles by lorry | 21-2-9  | 1000lbs | 69-13-3 |
|                               | Rehandling steel for work in river bed                              |         |         | 2-0-0   |
|                               | Fluctuation in L.S.D. rate                                          |         |         | 15-0-0  |
|                               | Sundries                                                            |         |         | 0-0-0   |
|                               |                                                                     |         |         | 695-0-0 |
|                               |                                                                     |         |         | Total   |

Certified that the leads allowed are correct to the best of my knowledge

# ESTIMATE DETAILED MEASUREMENT SHEET.

Sub Estimate for forming approaches for the Udyavara Bridge.

| Details of work.                                                                                                                                                                                                                                                           | Number. | Measurement in feet |                 |     | Area or Contents. |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------------------|-----------------|-----|-------------------|
|                                                                                                                                                                                                                                                                            |         | L.                  | B.              | D.  |                   |
| (1) Earth work Excavating and depositing on bank with a lead of $\frac{1}{2}$ furlong head load from quarry to river side, $\frac{1}{2}$ to 1 mile by boat along river and an average lead of 1 furlong head load from river to site in ordinary gravelly soil S. S. 20 A. |         |                     |                 |     |                   |
| As per separate calculation sheet attached.                                                                                                                                                                                                                                |         |                     |                 |     | 604000            |
| Total.                                                                                                                                                                                                                                                                     |         |                     |                 |     | 604000 Crt.       |
| (2) Soling with 6" cube hard laterite stones including hand packing and consolidation by stone roller.                                                                                                                                                                     |         |                     |                 |     |                   |
| <u>Mangalore side approach.</u>                                                                                                                                                                                                                                            |         |                     |                 |     |                   |
| From chainage 2545 to 3300                                                                                                                                                                                                                                                 | 1       | 755                 | 13-0            | 0-6 | 4908              |
| 2400 to 2545                                                                                                                                                                                                                                                               | 1       | 145                 | 13-0            | 0-6 | 943               |
| <u>Udipi side approach.</u>                                                                                                                                                                                                                                                |         |                     |                 |     |                   |
| From chainage 4158 to 5880                                                                                                                                                                                                                                                 | 1       | 1722                | 13-0            | 0-6 | 11193             |
| Extra for fan shape near bridge approaches.                                                                                                                                                                                                                                | 4       | 50-0                | $\frac{5-6}{2}$ | 0-6 | 275               |
| Add for the portions between the wings of the abutment and for a straight length of 10' beyond the wings.                                                                                                                                                                  | 2       | 29-0                | 11-0            | 0-6 | 319               |
| Total.                                                                                                                                                                                                                                                                     |         |                     |                 |     | 27638 Crt.        |
|                                                                                                                                                                                                                                                                            |         |                     |                 |     | or 27700 Crt.     |
| (3) (a) Collecting and stacking hard granite metal 2" size I.R.C. to standard gauge for bottom layer 3" thick.                                                                                                                                                             |         |                     |                 |     |                   |
| For Mangalore side approach.                                                                                                                                                                                                                                               | 1       | 755                 | 12-0            | 0-3 | 2265              |
| //do//                                                                                                                                                                                                                                                                     | 1       | 145                 | 12-0            | 0-3 | 435               |
| For Udipi side approach.                                                                                                                                                                                                                                                   | 1       | 1722                | 12-0            | 0-3 | 5146              |
| For fan shape new bridge approaches.                                                                                                                                                                                                                                       | 4       | 50-0                | $\frac{6-0}{2}$ | 0-3 | 150               |
| Add for the extra portion between the wings and for a straight length of 10' beyond wings.                                                                                                                                                                                 | 2       | 29-0                | 11-0            | 0-3 | 160               |
| Total.                                                                                                                                                                                                                                                                     |         |                     |                 |     | 8176 Crt.         |
|                                                                                                                                                                                                                                                                            |         |                     |                 |     | 8200 Crt.         |

| 1.                                                                                                                                                                                                                               | 2 | 3                                   | 4               | 5       | 6                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------------------------------|-----------------|---------|--------------------------|
| 3(b) Collecting and stacking hard granite metal $1\frac{1}{2}$ "                                                                                                                                                                 |   |                                     |                 |         |                          |
| size I.R.C. to Standard gauge for top layer, 2" thick.                                                                                                                                                                           |   |                                     |                 |         |                          |
| For Mangalore side approach.                                                                                                                                                                                                     | 1 | 755                                 | 12-0            | 0-2     | 1770                     |
| —do—                                                                                                                                                                                                                             | 1 | 145                                 | 12-0            | 0-2     | 290                      |
| Udipi side approach.                                                                                                                                                                                                             | 1 | 1722                                | 12-0            | 0-2     | 3444                     |
| Extra for fan shape near bridge approaches.                                                                                                                                                                                      | 4 | 50-0                                | 6-0/2           | 0-2     | 100                      |
| Add for the extra portion between the wings of abutment 2 and for a straight length of 10' beyond wings.                                                                                                                         | 2 | 29-0                                | 11-0            | 0-2     | 106                      |
|                                                                                                                                                                                                                                  |   |                                     |                 | Total.  | <u>3450 or 5500 Cft.</u> |
| (4) Collecting and stacking gravel.                                                                                                                                                                                              |   |                                     |                 |         |                          |
| Mangalore side approach.                                                                                                                                                                                                         | 1 | 755                                 | 12-0            | 0-1 3/4 | 1321                     |
| —do—                                                                                                                                                                                                                             | 1 | 145                                 | 12-0            | 0-1 3/4 | 253                      |
| Udipi side approach.                                                                                                                                                                                                             | 1 | 1722                                | 12-0            | 0-1 3/4 | 3014                     |
| Extra for fan shape near bridge approaches.                                                                                                                                                                                      | 4 | 50-0                                | $\frac{6-0}{2}$ | 0-1 3/4 | 80                       |
| Add for the extra portion between wings and for a length of 10'-0" beyond wings.                                                                                                                                                 | 2 | 29-0                                | 11-0            | 0-1 3/4 | 95                       |
|                                                                                                                                                                                                                                  |   |                                     |                 | Total.  | <u>4769 or 4837 Cft.</u> |
| (5) Spreading hard granite metal to 5" thickness in two layers of 3" and 2" of 2" size and $1\frac{1}{2}$ " size I.R.C. metal respectively including spreading gravel, watering and consolidation by power roller etc. complete. |   |                                     |                 |         |                          |
| Mangalore side approach.                                                                                                                                                                                                         | 1 | 755                                 | 12-0            |         | 9060                     |
| //do//                                                                                                                                                                                                                           | 1 | 145                                 | 12-0            | 1740    | 1740                     |
| Udipi side approach.                                                                                                                                                                                                             | 1 | 1722                                | 12-0            |         | 20664                    |
| Fan shape portion near bridge approaches.                                                                                                                                                                                        | 4 | 50-0                                | 6-0/2           |         | 600                      |
| Add for the extra portion between wings and for a straight length of 10' beyond wings.                                                                                                                                           | 2 | 29-0                                | 11-0            |         |                          |
|                                                                                                                                                                                                                                  |   |                                     |                 | Total.  | <u>630</u>               |
|                                                                                                                                                                                                                                  |   |                                     |                 |         | 32702 Sq.ft.             |
|                                                                                                                                                                                                                                  |   |                                     |                 |         | or <u>32000 Sq.ft.</u>   |
| (6) Earth work excavation for toe wall and revetment in ordinary soil with initial lead and lift S.S.20A. Mangalore side approach.                                                                                               |   |                                     |                 |         |                          |
| From chainage 2915 to 3010                                                                                                                                                                                                       | 2 | 95                                  | 4-0             | 2-6     | 1900                     |
| For quadrant portion near culvert at Chainage 3025                                                                                                                                                                               | 4 | $\frac{1}{2} \times 22/7 \times 25$ | 4-0             | 4-0     | 1257                     |

| 1.                              | 2 | 3.                                            | 4   | 5   | 6.                                   |
|---------------------------------|---|-----------------------------------------------|-----|-----|--------------------------------------|
| From chainage 3040 to 3224      | 2 | 244                                           | 4-0 | 2-6 | 4880                                 |
| Quadrant portion near abutment. | 2 | $\frac{1}{2} \times 22/7 \times 34$           | 4-0 | 3-0 | 642                                  |
| Udipi side approach.            |   |                                               |     |     |                                      |
| Quadrant portion near abutment. | 2 | $\frac{1}{2} \times 22/7 \times 34$           | 4-0 | 3-0 | 642                                  |
| From chainage 4175 to 4530      | 2 | 355                                           | 4-0 | 2-6 | 7100                                 |
| For culvert at chainage 5420    |   |                                               |     |     |                                      |
| Straight portion.               | 4 | 12-0                                          | 4-0 | 3-0 | 576                                  |
| Quadrant portion.               | 4 | $\frac{1}{2} \times 22/7 \times 28$           | 4-0 | 3-0 | 604                                  |
| For culvert at chainage 5620.   |   |                                               |     |     |                                      |
| Straight portion.               | 4 | 10-0                                          | 4-0 | 3-0 | 480                                  |
| Quadrant portion.               | 4 | $\frac{1}{2} \times 22/7 \times 16 \cdot 3''$ | 4-0 | 3-0 | 615                                  |
|                                 |   |                                               |     |     | <u>18694 or</u><br><u>19000 cfs.</u> |

7) Rough stone dry packing for apron and revetment

1' 0" thick on approaches. Mangalore side approach.

|                                               |   |                                       |      |                           |      |
|-----------------------------------------------|---|---------------------------------------|------|---------------------------|------|
| From chainage 2915 to 3010                    | 2 | 95                                    | 11-0 | 1-0                       | 2090 |
| For quadrant portion at culvert.              | 4 | $\frac{1}{2} \times 22/7 \times 25$   | 17-6 | 1-0                       | 622  |
| From chainage 3040 to 3100                    | 2 | 60                                    | 17-6 | 1-0                       | 2100 |
| From chainage 3100 to 3200                    | 2 | 100                                   | 19-0 | 1-0                       | 3600 |
| From chainage 3200 to 3284                    | 2 | 84                                    | 22-0 | 1-0                       | 3696 |
| Quadrant portion.                             | 2 | $\frac{1}{2} \times 22/7 \times 34/2$ | 21-0 | 1-0                       | 641  |
| Toe wall.                                     |   |                                       |      |                           |      |
| For straight portion chainage 2915 to 3010    | 2 | 95                                    | 4-0  | $\frac{1'0'' + 1'6''}{2}$ | 950  |
| Quadrant portion for culvert at chainage 3025 | 4 | $\frac{1}{2} \times 22/7 \times 25$   | 4-0  | $\frac{1'0'' + 1'6''}{2}$ | 393  |
| For straight portion chainage 3040 to 3284    | 2 | 244                                   | 4-0  | $\frac{1'0'' + 1'6''}{2}$ | 2440 |
| Quadrant portion at abutment.                 | 2 | $\frac{1}{2} \times 22/7 \times 34$   | 4-0  | $\frac{1'0'' + 1'6''}{2}$ | 267  |
| Udipi side branch.                            |   |                                       |      |                           |      |
| Quadrant portion.                             | 2 | $\frac{1}{2} \times 22/7 \times 34/2$ | 21-0 | 1-0                       | 641  |
| From chainage 4175 to 4256                    | 2 | 63                                    | 24-0 | 1-0                       | 3984 |
| From chainage 4256 to 4300                    | 2 | 42                                    | 24-0 | 1-0                       | 2016 |
| From chainage 4300 to 4530                    | 2 | 200                                   | 17-0 | 1-0                       | 6800 |
| For culvert at chainage 5420                  |   |                                       |      |                           |      |
| Straight portion.                             | 4 | 12-0                                  | 11-3 | 1-0                       | 540  |
| Quadrant portion.                             | 4 | $\frac{1}{2} \times 22/7 \times 16/2$ | 11-3 | 1-0                       | 283  |

| 1                                               | 2 | 3                                                                    | 4    | 5                         | 6                         |
|-------------------------------------------------|---|----------------------------------------------------------------------|------|---------------------------|---------------------------|
| For culvert t at chainage 5625.                 |   |                                                                      |      |                           |                           |
| Straight portion.                               | 4 | 10-0                                                                 | 11-8 | 1-0                       | 467                       |
| Quadrant portion.                               | 4 | $\frac{1}{2} \times 22 \frac{16'-3''}{7} \times 16 \frac{1}{2}$      | 11-8 | 1-0                       | 298                       |
| Toe wall.                                       |   |                                                                      |      |                           |                           |
| For abutment quadrant portion.                  | 2 | $\frac{1}{2} \times 22 \frac{1}{7} \times 34$                        | 4-0  | $\frac{1'0'' + 1'6''}{2}$ | 267                       |
| For straight portion from chainage 4175 to 4530 | 2 | 355                                                                  | 4-0  | $\frac{1'0'' + 1'6''}{2}$ | 3850                      |
| For culvert at chainage 5420                    |   |                                                                      |      |                           |                           |
| Straight portion.                               | 4 | 12-0                                                                 | 4-0  | $\frac{1'0'' + 1'6''}{2}$ | 240                       |
| Quadrant portion.                               | 4 | $\frac{1}{2} \times 22 \frac{1}{7} \times 16$                        | 4-0  | $\frac{1'0'' + 1'6''}{2}$ | 280                       |
| For culvert at chainage 5620                    | 4 | 10-0                                                                 | 4-0  | $\frac{1'0'' + 1'6''}{2}$ | 200                       |
| Quadrant portion.                               | 4 | $\frac{1}{2} \times 22 \frac{1}{7} \times 26 \frac{1}{3} \times 4-0$ |      | $\frac{1'0'' + 1'6''}{2}$ | 284                       |
| Total.                                          |   |                                                                      |      |                           | 3723 Cft. or 38000 Cft. - |

8) Providing R.C.C. hand Rails with cement concrete 1:2:4 with  $\frac{1}{4}$ " B.S.S. hard granite metal using 5.6 lbs of steel per Rft. excluding cost and conveyance of steel and cement and inclusive of cost of bending bars, tying grills etc., complete.

|                          |   |     |                   |
|--------------------------|---|-----|-------------------|
| Mangalore side approach. | 2 | 366 | 732               |
| Udipi side approach.     | 2 | 353 | 706               |
| Total.                   |   |     | 1438 or 1440 Rft. |

9) Supply of cement.

|                              |                                              |           |
|------------------------------|----------------------------------------------|-----------|
| For hand rails. R.C.C. work. | $2440 \times 0.714 \times 24/100$            | 247       |
| For hand rails.              |                                              |           |
| Foundation work.             | $1440 \times 1.06 \times 12 \frac{1}{2}/100$ | 191       |
|                              |                                              | 438 Cft.  |
|                              |                                              | 18.25 T.  |
| 10) Supply of steel.         | $1440 \times 5.6$                            | 8064 lbs. |
|                              |                                              | 3.6 Tons. |

Certified that the leads allowed are correct to the best of my knowledge.

APPROXIMATE EARTH WORK QUANTITY FOR APPROACHES OF BRIDGES ACROSS UDIYAVARA RIVER AT  
MILE 33/5 OF MANGALORE UDIPI COAST ROAD.

| Cross section<br>Ab.                                | Side slopes of<br>Embankment. | Area of cross<br>section.Sq.ft | Mean area.<br>Sq. Ft. | Distance between<br>cross section<br>Ft. | Quantity<br>of<br>Gravel Cft |
|-----------------------------------------------------|-------------------------------|--------------------------------|-----------------------|------------------------------------------|------------------------------|
| Ch. 2400 -2545                                      |                               |                                |                       |                                          | L.S. 15 Unit                 |
| C.S.No.1a<br>at ch.2545                             | -                             | 0                              |                       |                                          |                              |
|                                                     |                               |                                | 40                    | 55                                       | 2200                         |
| C.S.No.2<br>at Ch.2600                              | 1:1½                          | 80                             |                       |                                          |                              |
|                                                     |                               |                                | 104                   | 200                                      | 20800                        |
| C.S.No.3<br>at Ch.2800                              | 1:1½                          | 128                            |                       |                                          |                              |
|                                                     |                               |                                | 128                   | 115                                      | 14720                        |
| C.S.No.3a<br>at ch.2925                             | 1:1                           | 128<br>240                     |                       |                                          |                              |
|                                                     |                               |                                | 184                   | 85                                       | 15640                        |
| C.S.No.4<br>at ch.3000                              | 1:1                           | 240                            |                       |                                          |                              |
|                                                     |                               |                                | 368                   | 200                                      | 73600                        |
| C.S.No.5<br>at ch.3200                              | 1:1                           | 495                            |                       |                                          |                              |
|                                                     |                               |                                | 504                   | 100                                      | 50400                        |
| C.S.No.5a<br>at ch.3300                             | 1:1                           | 512                            |                       |                                          |                              |
| From chainage 3300 to Chainage 4158 Bridge portion. |                               |                                |                       |                                          |                              |
| C.S.No.6 at<br>Ch.4200 assumed<br>per Ch.4158 also. | 1:1                           | 615                            |                       |                                          |                              |
|                                                     |                               |                                | 628                   | 100                                      | 62800                        |
| C.S.No.6a<br>at ch.4258                             | 1:1                           | 640                            |                       |                                          |                              |
|                                                     |                               |                                | 505                   | 142                                      | 72720                        |
| C.S.No.7<br>at ch.4400                              | 1:1                           | 370                            |                       |                                          |                              |
|                                                     |                               |                                | 273                   | 150                                      | 35490                        |
| C.S.No.7a<br>at ch.4530                             | 1:1                           | 176                            |                       |                                          |                              |
|                                                     |                               |                                | 198                   | 70                                       | 13860                        |
| C.S.No.8<br>at ch.4600                              | 1:1½                          | 220                            |                       |                                          |                              |
|                                                     |                               |                                | 212                   | 200                                      | 42400                        |
| C.S.No.9<br>at Ch.4800                              | 1:1½                          | 204                            |                       |                                          |                              |
|                                                     |                               |                                | 208                   | 200                                      | 41600                        |
| C.S.No.10<br>at Ch.5000                             | 1:1½                          | 212                            |                       |                                          |                              |
|                                                     |                               |                                | 182                   | 200                                      | 36400                        |
| C.S.No.11<br>at Ch.5200                             | 1:1½                          | 152                            |                       |                                          |                              |
|                                                     |                               |                                | 146                   | 200                                      | 29200                        |
| C.S.No.12<br>at ch.5400                             | 1:1½                          | 140                            |                       |                                          |                              |
|                                                     |                               |                                | 120                   | 200                                      | 24000                        |
| C.S.No.13<br>at ch.5600                             | 1:1½                          | 100                            |                       |                                          |                              |
|                                                     |                               |                                | 50                    | 280                                      | 14000                        |
| C.S.No.14<br>at Ch.5880                             | /                             | 0                              |                       |                                          |                              |
| Total.                                              |                               |                                |                       |                                          | 563820                       |
| Add 10% for shrinkage.                              |                               |                                |                       |                                          | 56382                        |
| Total.                                              |                               |                                |                       |                                          | 620202                       |

DATA SHEET.

Name of work: Sub Estimate for forming approaches for Udyavara Bridge.

| Quantity.                                                                                                                                                                                                                                                                                       | Description.                                                                                                                                                              | Rate.    | Per.     | Amount.          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|------------------|
| 1) Earthwork excavating and depositing on bank with<br>a lead of $\frac{1}{2}$ furlong head load from quarry to river side,<br>$\frac{1}{2}$ to 1 mile by boat along river and an average lead of 1<br>furlong head load from river to site in ordinary gravelly<br>soil S.S.20A. per 1000 Cft. |                                                                                                                                                                           |          |          |                  |
| 1000 Cft.                                                                                                                                                                                                                                                                                       | Earthwork in gravelly soil.                                                                                                                                               | 20..7..0 | 100 Cft. | 20..7..0         |
|                                                                                                                                                                                                                                                                                                 | Lead $\frac{1}{2}$ furlong head load.                                                                                                                                     | 1..9..0  | 100 Cft. | 15.10..0         |
|                                                                                                                                                                                                                                                                                                 | Lead $\frac{1}{2}$ mile to 1 mile by boat.                                                                                                                                | 4.11..0  | 100 Cft. | 46.14..0         |
|                                                                                                                                                                                                                                                                                                 | Lead 1 furlong head load.                                                                                                                                                 | 2.14..0  | 100 Cft. | 28.12..0         |
|                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                           |          | Total.   | <u>111.11..0</u> |
| 2) Soling with 6" cube hard laterite stone including<br>hand packing and consolidation by stone roller per 100 Cft.                                                                                                                                                                             |                                                                                                                                                                           |          |          |                  |
| 100 Cft.                                                                                                                                                                                                                                                                                        | Soling stones laterite 6" cube.                                                                                                                                           | 6..0..0  | 100 Cft. | 6.00..0          |
| 25 Cft.                                                                                                                                                                                                                                                                                         | Stones $1\frac{1}{2}$ " to 3" size for filling and<br>wedging.                                                                                                            | 5..0..0  | 100 Cft. | 1..4..0          |
| 25 Cft.                                                                                                                                                                                                                                                                                         | Gravel.                                                                                                                                                                   | 1.12..0  | 100 Cft. | 0..7..0          |
| 125 Cft.                                                                                                                                                                                                                                                                                        | Lead for stones $\frac{1}{2}$ furlong head lead from<br>quarry to site, $\frac{1}{2}$ to 1 mile along the<br>river and 1 furlong average head lead from<br>river to site. | 9..2..0  | 100 Cft. | 9..2..0          |
| 25 Cft.                                                                                                                                                                                                                                                                                         | Lead for gravel as above.                                                                                                                                                 | 9..3..0  | 100 Cft. | 3..4..6          |
| 3 Nos.                                                                                                                                                                                                                                                                                          | Men Mazdoors for conveyance and laying.                                                                                                                                   | 1..8..0  | each.    | 4..8..0          |
| 2 Nos.                                                                                                                                                                                                                                                                                          | Women Mazdoors for conveyance.                                                                                                                                            | 0.12..0  | each.    | 1..8..0          |
| 2 Nos.                                                                                                                                                                                                                                                                                          | Men Mazdoors for packing, filling up<br>Voids etc.                                                                                                                        | 1..8..0  | each.    | 3..0..0          |
| 100 Cft.                                                                                                                                                                                                                                                                                        | Rolling the surface lightly including<br>watering.                                                                                                                        | L.S.     |          | 3..0..0          |
|                                                                                                                                                                                                                                                                                                 | Sundries.                                                                                                                                                                 |          |          | 0..0..6          |
|                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                           |          | Total.   | <u>31..2..0</u>  |
| 3 (a) Collecting and stacking hard granite metal<br>2" I.R.C. to standard gauge — 100 Cft.                                                                                                                                                                                                      |                                                                                                                                                                           |          |          |                  |
| 100 Cft.                                                                                                                                                                                                                                                                                        | Hard granite broken stone 2" I.R.C.                                                                                                                                       | 18..0..0 | 100 Cft. | 18..0..0         |
| 100 Cft.                                                                                                                                                                                                                                                                                        | Lead $1\frac{1}{2}$ mile by metalled road.                                                                                                                                | 9..6..0  | 100 Cft. | 9..6..0          |
|                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                           |          | Total.   | <u>27..6..0</u>  |

| 1.       | 2                                                                                                                                                              | 3.                    | 4.             | 5.              |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----------------|-----------------|
|          | 3 (b) Collecting and stacking hard granite metal                                                                                                               |                       |                |                 |
|          | 1½" I.R.C., to standard gauge--100 Cft.                                                                                                                        |                       |                |                 |
| 100 Cft. | Hard broken stone 1½"                                                                                                                                          | 22..0..0              | 100 Cft.       | 22..0..0        |
|          | Lead 1½ miles by metalled road.                                                                                                                                | 9..6..0               | 100 Cft.       | 9..6..0         |
|          |                                                                                                                                                                |                       | Total.         | <u>31..6..0</u> |
| 200 Cft. | (4) Collecting and stacking gravel.                                                                                                                            | 1.12..0               | 100 Cft.       | 1.12..0         |
|          | Lead: ½ furlong head load from quarry to river side; ½ to 1 mile along river and 1 furlong average head load from river side to site.                          |                       |                |                 |
|          |                                                                                                                                                                | 9..2..0               | 100 Cft.       | 9..2..0         |
|          |                                                                                                                                                                |                       | Total.         | <u>10.14..0</u> |
|          | 5, Spreading hard broken stone to 5" thickness                                                                                                                 |                       |                |                 |
|          | in 2 layers of 3" and 2" thick of 2" size and                                                                                                                  |                       |                |                 |
|          | 1½" size I.R.C. metal respectively including                                                                                                                   |                       |                |                 |
|          | gravel blinding, watering and consolidation                                                                                                                    |                       |                |                 |
|          | by power roller etc., complete//100 Sq.ft.                                                                                                                     |                       |                |                 |
|          |                                                                                                                                                                | 3" thick.             | 2" thick.      |                 |
| 100 Cft. | Spreading new metal, hand packing the metal to camber before rolling.                                                                                          | 6..7..0               | 6..6..0        |                 |
|          | Rolling, watering and consolidating granite metal with stone roller including the spreading the quantity of gravel when water is available within one furlong. | 0.11..0               | 0..9..0        |                 |
|          | Forming edge berms.                                                                                                                                            | 0..0..5               | 0..0..5        |                 |
|          | Maintaining berms for traffic barricading, providing danger lights. etc.                                                                                       | 0..1..3               | 0..1..3        |                 |
|          | Baskets, sharpening pick axes etc.                                                                                                                             | 0..3..6               | 0..3..6        |                 |
|          | Watering and keeping the surface moist for 15 days.                                                                                                            | 0..1..3               | 0..1..3        |                 |
|          | Sundries such as ropes, water pots etc.                                                                                                                        | 0..2..6               | 0..2..6        |                 |
|          | Extra for power roller consolidation.                                                                                                                          | 0.12..6               | 0.12..6        |                 |
|          |                                                                                                                                                                | <u>2..7..5</u>        | <u>2..4..5</u> |                 |
|          | Total.                                                                                                                                                         | 4..11..10 or 4..12..0 |                |                 |

| 1.         | 2                                                                                                                                                                                                                                                                                       | 3         | 4         | 5                |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|------------------|
|            | 6) Earthwork excavation for tow wall and revet/<br>ment in ordinary soils within initial lead and<br>lift 3.3.20 A- per 1000 Cft.                                                                                                                                                       |           |           |                  |
| 1000 Cft.  |                                                                                                                                                                                                                                                                                         | 11.14..0  | 1000 Cft. | 11..14..0        |
|            | 7) Rough stone dry packing for aprons and revet/<br>ments 1'0" thick- per 130 Cft.                                                                                                                                                                                                      |           |           |                  |
| 110 Cft.   | Rough stone including spalls for filling<br>and wedging.                                                                                                                                                                                                                                | 16..0..0  | 100 Cft.  | 17...9..7        |
| 1 Ko.      | Hodder.                                                                                                                                                                                                                                                                                 | 3..0..0   | each.     | 3...0..0         |
| 3 Kos.     | Man Masdoors.                                                                                                                                                                                                                                                                           | 1...8..0  | each.     | 4...8..0         |
| 2 Kos.     | Women Masdoors.                                                                                                                                                                                                                                                                         | 0.12..0   | each.     | 1...8..0         |
| 110 Cft.   | Lead 1 to 1½ mile metal road.                                                                                                                                                                                                                                                           | 9..6..0   | 100 Cft.  | 10...5..0        |
|            | Sundries.                                                                                                                                                                                                                                                                               |           |           | 0...1..5         |
|            |                                                                                                                                                                                                                                                                                         |           | Total.    | <u>37...0..0</u> |
|            | 8) Providing R.C.C. hand rails with cement concrete<br>1:2:4 with ½" D.S.S. hard granite metal using 5.6 lbs<br>of steel per Running foot excluding cost and conveyance<br>of steel and cement and inclusive of cost of bending bars,<br>tying grills etc. complete per 1 Running foot. |           |           |                  |
| 96 Cft.    | ½" B.S.S. metal.                                                                                                                                                                                                                                                                        | 55..0..0  | 100 Cft.  | 52..12..20       |
| 48 Cft.    | Sand.                                                                                                                                                                                                                                                                                   | 2..6..0   | 100 Cft.  | 1...3..2         |
| 1 Ko.      | Mason Second Class.                                                                                                                                                                                                                                                                     | 2112..0   | each.     | 2..12..0         |
| 6 Kos.     | Man Masdoors.                                                                                                                                                                                                                                                                           | 1...8..0  | each.     | 9...0..0         |
| 10 Kos.    | Women Masdoors.                                                                                                                                                                                                                                                                         | 0.12..0   | each.     | 7...8..0         |
| 96 Cft.    | Conveyance of metal 1½ mile metal road.                                                                                                                                                                                                                                                 | 9..6..0   | 100 Cft.  | 9...0...0        |
| L.S.       | Add for vibrated concrete work.                                                                                                                                                                                                                                                         |           |           | 15...0..0        |
|            | Sundries.                                                                                                                                                                                                                                                                               |           |           | <u>0...4..0</u>  |
|            |                                                                                                                                                                                                                                                                                         |           | Total.    | <u>97...8..0</u> |
|            | Rate per Cft. 97..8..0/100                                                                                                                                                                                                                                                              | 0..15..7. |           |                  |
| 0.714 Cft. | Rate per cement concrete for R.C.C.<br>work with ½" metal as per above item.                                                                                                                                                                                                            | 0.15..7   | Cft.      | 0..11..2         |
| 1.06 Cft.  | Cement concrete for foundation work<br>as per main estimate item No.7.                                                                                                                                                                                                                  | 53..0..0  |           |                  |
|            | Deduct for Rehandling Material in<br>River Bed.                                                                                                                                                                                                                                         | 7..0..0   | 100 Cft.  | 0...7..10        |
| 5.6 lbs.   | Tying grills.                                                                                                                                                                                                                                                                           | 0..1..0   | 1 Cft.    | 0...5..7         |
|            | Centering charges.                                                                                                                                                                                                                                                                      |           |           | 2...0..0         |
|            | Sundries.                                                                                                                                                                                                                                                                               |           |           | <u>0...0..5</u>  |
|            |                                                                                                                                                                                                                                                                                         |           | TOTAL.    | <u>3...9..0</u>  |

| 1.      | 2                                                              | 3         | 4         | 5                |
|---------|----------------------------------------------------------------|-----------|-----------|------------------|
|         | 9) Supply of cement—per ton,                                   |           |           |                  |
| 1 Ton.  | Current I.S.D. rate.                                           | 72..0..0  | Ton.      | 72..0..0         |
|         | Inspection charges 2%                                          |           |           | 2..7..0          |
|         | Sales tax at 0.0.3 per Re.                                     |           |           | 2..2..0          |
|         | Storage charges.                                               |           |           | 2..0..0          |
|         | Loading and unloading charges.                                 |           |           | 2..0..0          |
|         | Railway freight from Madharai to Mangalore.                    |           |           | 15..2..0         |
| 24 Cft. | Conveyance from Mangalore to bridge site Via Udipi 60½ miles . | 136.12.6  | 100 Cft.  | 32.13..3         |
|         | Fluctuations in I.S.D. rate.                                   |           |           | 10..0..0         |
|         | Sundries.                                                      |           |           | 0..2..9          |
|         |                                                                |           | Total.    | <u>137..0..0</u> |
|         | 10) Supply of steel per ton.                                   |           |           |                  |
| 1 Ton.  | Steel I.S.D. rate.                                             | 480..0..0 | ton.      | 480..0..0        |
|         | Inspection charges                                             |           |           | 9..9..7          |
|         | Sales tax at 0.0.3 per Re.                                     |           |           | 7..6..0          |
|         | Storage charges.                                               |           |           | 2..0..0          |
|         | Loading and unloading charges.                                 |           |           | 2..0..0          |
|         | Railway freight from Madras.                                   |           |           | 47..0..0         |
|         | Conveyance from Mangalore to Bridge site via Udipi, 60½ miles. | 31..2..9  | 1000 lbs. | 69.13..2         |
|         | Fluctuation in I.S.D. rate.                                    |           |           | 15..0..0         |
|         | Sundries.                                                      |           |           | 0..1..3          |
|         |                                                                |           | Total.    | <u>633..0..0</u> |

~~Certified that the leads allowed are correct to the best of my knowledge.~~

ESTIMATE FORM-ABSTRACT

Name of work: Sub estimate for Forming approaches for Udyavar Bridge.

| Quantity.   | Description of work.                                                                                                                                                                                                                                               | Rate.     | Per.      | Amount.             |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|---------------------|
| 620000 Cft. | 1) Earthwork excavating and depositing on bank with a lead of $\frac{1}{2}$ furlong head load; from quarry to river side, $\frac{1}{2}$ to 1 mile along the river and an average lead of 1 furlong head load from river to site in ordinary gravelly soil S.S.20A. | 111.11.0  | 1000Cft.  | 69245               |
| 27700 Cft.  | 2) Soling with 6" cube hard laterite stones including hand packing and consolidation by stone roller.                                                                                                                                                              | 31..2.0   | 100 Cft.  | 8622                |
| 8200 Cft.   | 3 (a) Collecting and stacking hard granite metal 2" H.R.C. to standard gauge.                                                                                                                                                                                      | 27,,6.0   | 100 Cft.  | 2245                |
| 5500 Cft.   | 3 (b) Collecting and stacking hard granite metal $1\frac{1}{2}$ " I.R.C. to standard gauge.                                                                                                                                                                        | 31..6.0   | 100 Cft.  | 1726                |
| 1500 Cft.   | 4) Collecting and stacking gravel for approaches.                                                                                                                                                                                                                  | 10.14.0   | 100 Cft.  | 522                 |
| 32000 Cft.  | 5) Spreading hard broken stone to 5" thickness in 2 layers of 3" and 2" thick of 2" size and $1\frac{1}{2}$ " size metal respectively including gravel blinding, watering and consolidation by power roller etc. complete.                                         | 4.12..0   | 100 Cft.  | 1560                |
| 17,000 Cft. | 6) Earthwork excavation for toe wall and revetment in ordinary soils within initial lead and 1ft S.S.20A.                                                                                                                                                          | 11.14.0   | 1000 Cft. | 226                 |
| 38,000 Cft. | 7) Rough stone dry packing for aprons and revetment 1'0" thick.                                                                                                                                                                                                    | 37..0..0  | 100 Cft.  | 14060               |
| 1,440 Rft.  | 8) Providing R.C.C. hand rails with cement concrete 1:2:4 with $\frac{1}{2}$ " B.S.S. hard granite metal using 5.6 lbs of steel per running foot excluding cost of steel and cement and inclusive of cost of bending bars, tying grills, etc. complete.            | 3.9..0    | Rft.      | 5180                |
| 18.25 T.    | 9) Supply of cement.                                                                                                                                                                                                                                               | 137..0.0  | Ton.      | 2500                |
| 3.6 T.      | 10) Supply of steel.                                                                                                                                                                                                                                               | 633..0..0 | Ton.      | 2279                |
|             |                                                                                                                                                                                                                                                                    |           | Total.    | 108224 or Rs.108200 |

6/2/5  
2/10/

REPORT TO ACCOMPANY THE SUB ESTIMATE FOR RECONSTRUCTING THE CULVERT  
AT CHINAGE 5620 OF UDAYAVAR BRIDGE APPROACH.

Estimate. Rs. 9,600/-

The culvert at 33/8 of Mangalore Baindur coast road comes in the approaches of the Udayavar Bridge. As per the proposals for the Bridge, the existing road at the place will get raised by 2.34 ft. This culvert besides being narrow with only 17'6" clear roadway is also in a very dilapidated condition. It is therefore proposed to reconstruct it.

The soil is sandy loam even upto 12 ft. depth and so it is proposed to take the foundations only 6 ft. below sill level as this is considered safe enough from being scoured and also for the pressure which works out to about 1 ton per Sq. ft.

The existing culvert is a skew one of 3 spans of 2½ ft. with 2 piers of 3 ft totaling to 13½ ft. from abutment face to abutment face. The skew angle is 20°. It is proposed to reconstruct it with a single span of about 9.4 ft. on the square and 10' on the skew as the regime width of the channel is found to be this.

Cement concrete 1:2:4 2 ft. thick will be laid for the foundations as heavy springs are expected. The width of the concrete will be 6'6".

The masonry will be of coursed rubble 2nd sort in foundations and substructure excepting for the parapets which will be of 1st sort. The width of the masonry will be 5'6" and in substructure 5'0" at bottom reduced to 2'0" at top. The wing walls will be 10' 1½" long and will have the same section as the abutment.

Over the abutment R.C. slab 3:2:4, 13" thick with details of reinforcement as given in Drg. No.80/47 of I.R.C. Journal Vol.1/3 will be laid.

The parapets will be 1'6" thick and 2' 6" high. The clear roadway will be 24'0".

The rates adopted are the current schedule of rates of South Kanara District.

The work will be carried out as per M.D.S.D. and other special specifications and circulars.

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# ESTIMATE DETAILED MEASUREMENT SHEET.

Name of work, Sub Estimate for Reconstructing the culvert at chainage 5620' of  
Udayavar Bridge approach.

| Details of work.                                                         | Number. | Measurement in feet.      |                 |            | Area or Contents.                  |
|--------------------------------------------------------------------------|---------|---------------------------|-----------------|------------|------------------------------------|
|                                                                          |         | <u>///</u><br>L           | B               | D          |                                    |
| <hr/>                                                                    |         |                           |                 |            |                                    |
| 1) Earthwork excavation for foundation in ordinary soil                  |         |                           |                 |            |                                    |
| including shuttering, baling out water etc.                              |         |                           |                 |            |                                    |
| Foundations of abutment and wings.                                       | 2       | <sup>40.20</sup><br>40.25 | 6-6             | 6-0        | 3136                               |
| Extra for sloping banks etc.                                             | L.S.    |                           |                 |            | 1864                               |
|                                                                          |         |                           |                 | Total.     | <u>5000 Cft.</u>                   |
| <hr/>                                                                    |         |                           |                 |            |                                    |
| 2) Cement concrete 1:2:4 with 1 1/2" B.S.S. hard granite metal           |         |                           |                 |            |                                    |
| excluding cost and conveyance of cement but inclusive of                 |         |                           |                 |            |                                    |
| shuttering, baling out water etc.                                        |         |                           |                 |            |                                    |
| Foundation of abutment and wings.                                        | 2       | 40.20                     | 6-6             | 2-0        | 1045                               |
|                                                                          |         |                           |                 | Total.     | <u>1045 or</u><br><u>1050 Cft.</u> |
| <hr/>                                                                    |         |                           |                 |            |                                    |
| 3) Coursed rubble masonry 2nd sort in cement mortar 1:4 includ-          |         |                           |                 |            |                                    |
| ing simultaneous pointing finish with cement mortar 1:3                  |         |                           |                 |            |                                    |
| excluding cost and conveyance of cement.                                 |         |                           |                 |            |                                    |
| Substructure--abutments and wings.                                       | 2       | 38.84                     | 5-6             | 4-0        | 1709                               |
| Superstructure/abutments and wings.                                      | 2       | $\frac{29.41 + 50.05}{2}$ | $\frac{5+2}{2}$ | 7.02       | 1952                               |
| For returns.                                                             | 2       | 30-3                      | 2-0             | 1.25       | 151                                |
| Back wall.                                                               | 2       | 25.8                      | 1-8             | 1-1        | 70                                 |
|                                                                          |         |                           |                 | Total.     | 3769                               |
| Deduct for slab portion.                                                 | 2       | 11-8                      | 2-0             | 1-1        | 51                                 |
|                                                                          |         |                           |                 | Net Total. | <u>3812 or</u><br><u>3830 Cft.</u> |
| <hr/>                                                                    |         |                           |                 |            |                                    |
| 4) Coursed rubble masonry 1st sort in cement mortar 1:4                  |         |                           |                 |            |                                    |
| including simultaneous pointing finish with cement mortar                |         |                           |                 |            |                                    |
| 1:3 excluding cost and conveyance of cement.                             |         |                           |                 |            |                                    |
| Parapet.                                                                 | 2       | 30-3                      | 1-6             | 2-0        | 183                                |
| Extra for pilasters                                                      | 2nd     | 2-0                       | 0-6             | 2-0        | 16                                 |
|                                                                          |         |                           |                 | Total.     | <u>198 or 200 Cft.</u>             |
| <hr/>                                                                    |         |                           |                 |            |                                    |
| 5) Vibrated cement concrete 1:2:4 with 3/4" B.S.S. hard granite metal    |         |                           |                 |            |                                    |
| using 6.44 lbs of steel per cft excluding cost and conveyance of cement, |         |                           |                 |            |                                    |
| but inclusive of bending bars, tying grille, centering etc complete.     |         |                           |                 |            |                                    |
| Deck slab.                                                               | 1       | 28-0                      | 11-0            | 1-1        | 334                                |
|                                                                          |         |                           |                 | Total.     | <u>334 or</u><br><u>340 Cft.</u>   |

| 1.                                                                                                                                                                                                                                | 2.                                           | 3.                                  | 4.   | 5.     | 6.                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------------------------|------|--------|---------------------|
| 6) Vibrated Cement Concrete 1:1½:3 with 65% of 1" size, 25% of ½" size and 10% of ¼" size I.R.C. metal including cost and conveyance of cement but exclusive of tamping, finishing etc complete for wearing coat over deck slabs. |                                              |                                     |      |        |                     |
| Over deck slabs.                                                                                                                                                                                                                  | 1                                            | 38-0                                | 11-0 | 0-3    | 77 Cft.             |
| 7) Cement concrete 1:2:4 with 1½" B.S.S. hard granite metal excluding cost and conveyance of cement but inclusive of shuttering complete for coping.                                                                              |                                              |                                     |      |        |                     |
| Coping over parapets.                                                                                                                                                                                                             | 2                                            | 30-3                                | 2-0  | 0-6    | 61                  |
|                                                                                                                                                                                                                                   |                                              |                                     |      |        | <u>61 or 65 Cft</u> |
| 8) Supply of Cement.                                                                                                                                                                                                              |                                              |                                     |      |        |                     |
| i) Foundation concrete.                                                                                                                                                                                                           | 1050                                         | $\times \frac{24}{96}$              |      |        | 263                 |
| ii) C.R.Masonry 2nd sort.                                                                                                                                                                                                         | 3850                                         | $\times \frac{32}{100}$             |      |        | 908                 |
| iii) C.R.Masonry 1st Sort.                                                                                                                                                                                                        | 200                                          | $\times \frac{28}{100}$             |      |        | 14                  |
| iv) R.C.C. decking.                                                                                                                                                                                                               | 340                                          | $\times \frac{24}{96}$              |      |        | 85                  |
| v) Coping concrete.                                                                                                                                                                                                               | 65                                           | $\times \frac{24}{96}$              |      |        | 16                  |
| vi) Wearing coat.                                                                                                                                                                                                                 | 77                                           | $\times \frac{33 \frac{1}{3}}{100}$ |      |        | 26                  |
|                                                                                                                                                                                                                                   |                                              |                                     |      |        | <u>712 Cft.</u>     |
|                                                                                                                                                                                                                                   |                                              |                                     |      | Total. | or 28.5 Tons.       |
|                                                                                                                                                                                                                                   |                                              |                                     |      |        | or 29.00 Tons.      |
| 9) Supply of steel.                                                                                                                                                                                                               |                                              |                                     |      |        |                     |
| For deck slab.                                                                                                                                                                                                                    | as per schedule. 2150 lbs or <u>one ton.</u> |                                     |      |        |                     |

  
 28/12/71

# ESTIMATE DATA SHEET.

Name of work: Sub Estimate for Reconstructing the culvert at chainage 5620 of Udayavar  
Bridge approach.

| Quantity. | Description.                                                                                                                                                               | Rate.    | Per.          | Amount.         |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------|-----------------|
| <hr/>     |                                                                                                                                                                            |          |               |                 |
|           | 1) Earth work excavation for foundation in ordinary soil including, shuttering, baling out of water etc. per 1000 Cft.                                                     |          |               |                 |
|           | Rate as per S.I.No.13 A.                                                                                                                                                   | 27..8..0 | 1000 Cft.     | 27..8..0        |
| L.S.      | For shuttering.                                                                                                                                                            |          |               | 25..0..0        |
| L.S.      | For baling out extra depth of water.                                                                                                                                       |          |               | 25..0..0        |
|           |                                                                                                                                                                            | Total.   |               | <u>77..8..0</u> |
|           |                                                                                                                                                                            |          |               |                 |
|           | 2) Cement Concrete 1:2:4 with 1½" B.S.S. hard granite metal excluding cost and conveyance of cement but inclusive of shuttering, baling out of water etc. per 100 Cft.     |          |               |                 |
| 100 Cft.  | 1½" B.S.S. metal.                                                                                                                                                          | 23..0..0 | 100 Cft.      | 23..0..0        |
| 50 Cft.   | Sand.                                                                                                                                                                      | 2..8..0  | 100 Cft.      | 1..4..0         |
| ½ No.     | Mason II Class.                                                                                                                                                            | 2.12..0  | each.         | 2..6..0         |
| 5 Nos.    | Men Handbars.                                                                                                                                                              | 1..8..0  | each.         | 7..8..0         |
| 4 Nos.    | Women Handbars.                                                                                                                                                            | 0.12..0  | each.         | 3..0..0         |
| 100 Cft.  | Lead 1 mile metalled road.                                                                                                                                                 | 7..0..6  | each 100 Cft. | 7..0..6         |
| L.S.      | Baling out of water etc.                                                                                                                                                   | 7.       |               | 7..0..0         |
| L.S.      | Shuttering.                                                                                                                                                                |          |               | 7..0..0         |
|           | Sundries.                                                                                                                                                                  |          |               | 0..5..6         |
|           |                                                                                                                                                                            | Total.   |               | <u>57..8..0</u> |
|           |                                                                                                                                                                            |          |               |                 |
|           | 3) Coursed rubble masonry 2nd sort in cement mortar 1:4 including simultaneous pointing finish with cement mortar 1:3 excluding cost and conveyance of cement per 100 Cft. |          |               |                 |
| 110 Cft.  | C.R. Stones 2nd sort including bond stones.                                                                                                                                | 28.0..0  | 100 Cft.      | 30.12.10        |
| 32 Cft.   | Sand.                                                                                                                                                                      | 2..8..0  | 100 Cft.      | 0.12.10         |
| 7 Nos.    | Mason II Class.                                                                                                                                                            | 2.12..0  | each.         | 19..4..0        |
| 4 Nos.    | Men Handbars.                                                                                                                                                              | 1..8..0  | each.         | 6..0..0         |
| 4 Nos.    | Women Handbars.                                                                                                                                                            | 0.12..0  | each.         | 3..0..0         |
| 22 Cft.   | Mixing mortar.                                                                                                                                                             | 4..8..0  | 100 Cft.      | 1..7..0         |
| L.S.      | Pointing with cement mortar.                                                                                                                                               |          |               | 2..0..0         |
| L.S.      | Scaffolding charges.                                                                                                                                                       |          |               | 2..0..0         |

| 1.                                                     | 2                                           | 3        | 4        | 5               |
|--------------------------------------------------------|---------------------------------------------|----------|----------|-----------------|
| L.S.                                                   | Baling charges.                             |          |          | 5..0..0         |
| 110 Cft.                                               | C.R. Stones carted 1 mile.                  | 7..0 .6  | 100 Cft. | 7.11..9         |
|                                                        | Sundries.                                   |          |          | 0..7.7          |
|                                                        |                                             |          | Total.   | <u>78..8..0</u> |
| 4) Coursed rubble masonry 1st sort in cement mortar    |                                             |          |          |                 |
| 1;4 including simultaneous pointing finish with cement |                                             |          |          |                 |
| mortar 1:3 excluding cost and conveyance of cement.    |                                             |          |          |                 |
| per 100 Cft.                                           |                                             |          |          |                 |
| 110 Cft.                                               | C.R. Stones 1st sort including bond stones. | 38..0..0 | 100 Cft. | 41.12..20       |
| 20 Cft.                                                | Sand.                                       | 2..8..0  | 100 Cft. | 0,11.. 2        |
| 10 Nos.                                                | Mason 2nd Class.                            | 3.12...0 | each.    | 27..8..0        |
| 4 Nos.                                                 | Men Handbars.                               | 1..8..0  | each.    | 6..0..0         |
| 4 Nos.                                                 | Women Handbars.                             | 0.12..0  | each.    | 2..0..0         |
| 20 Cft.                                                | Mixing mortar.                              | 4..8..0  | 100 Cft. | 1..4..2         |
| L.S.                                                   | Pointing with cement mortar.                |          |          | 2..0..0         |
| L.S.                                                   | Scaffolding charges.                        |          |          | 2..0..0         |
| 110 Cft.                                               | C.R. Stones carted 1 mile.                  | 7..0..6  | 100 Cft. | 7.11..9         |
|                                                        | Sundries.                                   |          |          | 0..0..1         |
|                                                        |                                             |          | Total.   | <u>92..0..0</u> |
| 5) Vibrated cement concrete 1;2;4 with 3/4" B.S.S.     |                                             |          |          |                 |
| hard granite metal excluding cost and conveyance of    |                                             |          |          |                 |
| cement and steel for reinforced concrete item -        |                                             |          |          |                 |
| per cft. Quantities for 100 Cft.                       |                                             |          |          |                 |
| 96 Cft.                                                | 3/4" B.S.S. metal.                          | 42..0..0 | 100 Cft. | 40..5..2        |
| 42 Cft.                                                | Sand.                                       | 2..8..0  | 100 Cft. | 1..3..2         |
| 1 No.                                                  | Mason 2nd class.                            | 2.13..0  | each.    | 2.12..0         |
| 6 Nos.                                                 | Men Handbars.                               | 1..8..0  | each.    | 9..0..0         |
| 10 Nos.                                                | Women Handbars.                             | 0.12..0  | each.    | 7..8..0         |
| 96 Cft.                                                | Conveyance of metal 1 mile road.            | 7..0..6  | 100 Cft. | 6.12..0         |
| L.S.                                                   | For Vibrated concrete work.                 |          |          | 15..0..0        |
|                                                        | Sundries.                                   |          |          | 0..3..8         |
|                                                        |                                             |          | Total.   | <u>83..12.0</u> |

Rate per Cft. 83..12..0 /100 0..13..3

| 1.                                                                                                                                                                                                                                             | 2                                   | 3              | 4        | 5               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------|----------|-----------------|
| 6) Vibrated Cement concrete 1:1½:3 with 65% of 1" size, 25% of ½" size and 10% of ¼" size I.R.C. hard granite metal excluding cost and conveyance of cement, but inclusive of tamping, finishing etc. complete for wearing coat.               |                                     |                |          |                 |
| 65 Cft.                                                                                                                                                                                                                                        | 1" size metal I.R.Cs.               | 30..0..0       | 100 Cft. | 29..8..0        |
| 25 Cft.                                                                                                                                                                                                                                        | ½" size metal I.R.C.                | 55..0..0       | 100 Cft. | 13.12..0        |
| 10 Cft.                                                                                                                                                                                                                                        | ¼" size metal I.R.C.                | 70..0..0       | 100 Cft. | 7..0..0         |
| 50 Cft.                                                                                                                                                                                                                                        | Sand.                               | 2..8..0        | 100 Cft. | 1..4..0         |
| 1 No.                                                                                                                                                                                                                                          | Mason I Class.                      | 3..2..0        | each.    | 3..2..0         |
| 6 Nos.                                                                                                                                                                                                                                         | Man Mazdoors.                       | 1..8..0        | each     | 9..0..0         |
| 10 Nos.                                                                                                                                                                                                                                        | Woman Mazdoor.                      | 0.12..0        | each.    | 7..8..0         |
| 3 Nos.                                                                                                                                                                                                                                         | Mason II Class for finishing.       | 2.12..0        | each.    | 8..4..0         |
| L.S.                                                                                                                                                                                                                                           | Add for vibrated concrete.          |                |          | 15..0..0        |
| 100 Cft.                                                                                                                                                                                                                                       | Conveyance of metal 1 Mile by road. | 7..0..6        | 100 Cft. | 7..0..6         |
|                                                                                                                                                                                                                                                | Sundries.                           |                |          | 0..1..6         |
|                                                                                                                                                                                                                                                |                                     |                | Total.   | <u>91..8..0</u> |
| 7) Cement concrete 1:2;4 with 1½" B.S.S. hard granite metal exclusive of cost and conveyance of cement for coping over parapet—per 100 Cft.                                                                                                    |                                     |                |          |                 |
|                                                                                                                                                                                                                                                | As per item (2)                     | 57..8..0       | 100 Cft. | 50..8..0        |
|                                                                                                                                                                                                                                                | Deduct for baling out water.        | 7..0..0        | 100 Cft. |                 |
|                                                                                                                                                                                                                                                | Per Cft. 50..8..0 /100              | 0..8..1        |          |                 |
|                                                                                                                                                                                                                                                | Sundries.                           | 0..0..11       |          |                 |
|                                                                                                                                                                                                                                                | TOTAL.                              | <u>0..9..0</u> |          |                 |
| 8) Vibrated cement concrete 1:2:4 mix with 3/4" size B.S.S. hard granite metal using 6.66 lbs of steel per cft exclusive of cost and conveyance of cement and steel but inclusive of cost of bending bars, tying grills etc. complete per Cft. |                                     |                |          |                 |
| 1 Cft.                                                                                                                                                                                                                                         | As per item (5)                     | 0.13..3        | Cft.     | 0..13..3        |
| 6.44 lbs.                                                                                                                                                                                                                                      | Tying grills.                       | 0..1..0        | lbs.     | 0...6..5        |
| 12/13 Wft.                                                                                                                                                                                                                                     | Centering. S.I.39A.                 | 0.11..3        | Sq.ft.   | 0..10..5        |
|                                                                                                                                                                                                                                                | Sundries.                           |                |          | 0..1..11        |
|                                                                                                                                                                                                                                                |                                     |                | Total.   | <u>2..0..0</u>  |

| 1       | 2                                                             | 3                 | 4 | 5                |
|---------|---------------------------------------------------------------|-------------------|---|------------------|
|         | 9) Supply of cement per ton.                                  |                   |   |                  |
| 1 Ton.  | Cement I.S.D. rate.                                           | 72..0..0 Ton.     |   | 72..0..0         |
|         | Inspection charges 2%                                         |                   |   | 1..7..0          |
|         | Sales tax 0.0.3 per Rs.                                       |                   |   | 2..2..0          |
|         | Storage charges.                                              |                   |   | 2..0..0          |
|         | Loading and unloading charges.                                |                   |   | 2..0..0          |
|         | Railway freight from Madhukeral to Mangalore.                 |                   |   | 15..1..0         |
| 24 Cft. | Conveyance from Mangalore to Bridge site 60 miles Via Udipi.  | 135.12.6 100 Cft. |   | 32..9..5         |
|         | Fluctuation in I.S.D. rate.                                   |                   |   | 10..0..0         |
|         | Sundries.                                                     |                   |   | 0..0..7          |
|         |                                                               | Total.            |   | <u>136..4..0</u> |
|         | 9) Supply of steel//per ton.                                  |                   |   |                  |
| 1 Ton.  | Steel I.S.D. rate.                                            | 480..0..0 ton.    |   | 480..0..0        |
|         | Inspection charges at 2%                                      |                   |   | 9..9..7          |
|         | Sales tax 0.0.3 per Rs.                                       |                   |   | 7..8..0          |
|         | Storage charges.                                              |                   |   | 2..0..0          |
|         | Loading and unloading charges.                                |                   |   | 2..0..0          |
|         | Railway freight from Madras to Mangalore.                     |                   |   | 47..0..0         |
|         | Conveyance from Mangalore to Bridge site, 60 miles Via Udipi. | 30.15.0 1000 lbs. |   | 69..4..10        |
|         | Fluctuation in I.S.D. rate.                                   |                   |   | 15..0..0         |
|         | Sundries.                                                     |                   |   | 0..9..7          |
|         |                                                               | Total.            |   | <u>633..0..0</u> |

Certified that the loads allowed are correct to the best of my knowledge.

6/10  
28/2/55  
D/B

ESTIMATE FORM ABSTRACT:

Name of work: Sub Estimate for reconstructing the culvert at Chainage 5620 of Udayavar Bridge approaches.

| Quantity. | Description of work.                                                                                                                                                                                                           | Rate.     | Per. .    | Amount. |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|---------|
| 5000 Cft. | 1) Earthwork excavation for foundation ordinary soil including shuttering, baling out water etc.                                                                                                                               | 77..8..0  | 1000 Cft. | 308     |
| 1050 Cft. | 2) Cement concrete 1:2:4 with 1 1/2" B.S.S. hard granite metal excluding cost and conveyance of cement but inclusive of shuttering, baling out water etc.                                                                      | 57..8..0  | 100 Cft.  | 604     |
| 3850 Cft. | 3) Coursed rubble masonry 2nd sort in cement mortar 1:4 including simultaneous pointing finish with cement mortar 1:3 excluding cost and conveyance of cement.                                                                 | 78..8..0  | 100 Cft.  | 3022    |
| 200 Cft.  | 4) Coursed rubble masonry 1st sort in cement mortar 1:4 including simultaneous pointing finish with cement mortar 1:3 excluding cost and conveyance of cement.                                                                 | 91..0..0  | 100Cft.   | 185     |
| 340 Cft.  | 5) Vibrated cement concrete 1:2:4 with 3/4" B.S.C. hard granite metal using 6.44 lbs of steel per Cft. excluding cost and conveyance of cement but inclusive of bending bars, tying grills, centering etc. complete.           | 2..0..0   | cft.      | 680     |
| 77 Cft.   | Vibrated Cement Concrete 1:1 1/2:3 with 65% of 1" Size, 25% of 3/4" size and 10% of 1/2" size L.R.C. hard granite metal excluding cost and conveyance of cement but inclusive of tamping, finishing, etc complete for wearing/ | 91..8..0  | 100Cft.   | 70      |
| 65 Cft.   | 7) Cement concrete 1:2:4 with 1 1/2" B.S.S. hard granite metal excluding cost and conveyance of cement but inclusive of shuttering, complete for coping.                                                                       | 0..9..0   | Cft.      | 37      |
| 29 Tons.  | 8) Supply of cement.                                                                                                                                                                                                           | 136..4..0 | ton.      | 3951    |
| 1 Ton.    | 9) Supply of steel.                                                                                                                                                                                                            | 633..0..0 | ton.      | 633     |
| L.S.      | 10) For foundations under pilasters in 1:4:8 concrete.                                                                                                                                                                         |           |           | 31      |
|           | Total.                                                                                                                                                                                                                         |           |           | 9600    |

(9/2/21)  
21/2/21

REPORT TO ACCOMPANY THE SUB ESTIMATE FOR RECONSTRUCTING THE CULVERT  
AT CHAINAGE 5420' OF UDAYAVAR BRIDGE APPROACH.

...ooo...

Estimate Rs: 8,000/-.

The 3' span culvert at 33/7 of Mangalore Baindur coast road comes in the approaches of the Udayavar Bridge and as per the proposals for the bridge, the level of the existing road at the place gets raised by 3.8 ft. The culvert besides being narrow with only 17' 6" clear roadway is also in a dilapidated condition. It is therefore proposed to reconstruct it.

The soil is sandy loam even upto 23 12 ft and so it is proposed to take the foundations only 6 ft below sill level as this is considered safe enough from being scoured and also for the pressure which works out to about 1 ton per sq.ft.

Cement concrete 1:2:4, 2 ft. thick will be laid for the foundations as heavy springs are expected. The concrete for both the abutments will be laid in one block including the ventway portion as it is too narrow for the earth in between to stand by itself.

The masonry will be of coursed rubble 2nd sort in foundations and superstructure excepting for the parapets which will be of 1st sort. The width of masonry will be 5' 6" in foundation and in superstructure 5'0" at bottom reduced to 2' 0" at top. The wing walls will be 10' long and will have the same section as the abutment.

Over the abutment R.C.slab 1:2:4 7" thick with details of reinforcement as shown in the drawing will be provided.

The parapets will be 1'6" thick and 2' 6" high. The clear roadway will be 24'0"

The rates adopted are the current schedule of rates of South Kanara District.

The work will be carried out as per H.D.S.S. and other special specifications and circulars.

# ESTIMATE-DETAILED MEASUREMENT SHEET.

~~Page 15-10831~~

Name of work: Sub Estimate for Reconstructing the culvert at Chirage 5420 of  
Udayavar Bridge approach.

| Details of work.                                                                                                                                                | Number | Measurement in feet         |                     |                    | Area or Contents.   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------------------------|---------------------|--------------------|---------------------|
|                                                                                                                                                                 |        | L.                          | B.                  | D.                 |                     |
| 1) Earthwork excavation for foundations in ordinary soil including shuttering, baling out of water etc. complete.                                               |        |                             |                     |                    |                     |
| a) Under abutments.                                                                                                                                             | 2      | 14-6                        | 29-0                | 10-6               | 4415                |
| b) Under wings.                                                                                                                                                 | 4      | 4-9                         | 6-6                 | 10-6               | <u>1297</u>         |
|                                                                                                                                                                 |        |                             |                     | Total.             | 5712                |
|                                                                                                                                                                 |        |                             |                     |                    | or <u>5800 Cft.</u> |
| 2) Cement concrete 1:2:4 with 1½" B.S.S. hard granite metal excluding cost and conveyance of cement, but inclusive of shuttering, baling out of water etc.      |        |                             |                     |                    |                     |
| a) Under abutments.                                                                                                                                             | 2      | 14-6                        | 29-0                | 2-0                | 841                 |
| b) Under wings.                                                                                                                                                 | 4      | 4-9                         | 6-6                 | 2-0                | <u>257</u>          |
|                                                                                                                                                                 |        |                             |                     | Total. ...         | 1098                |
|                                                                                                                                                                 |        |                             |                     |                    | or <u>1090 Cft.</u> |
| 3) Coursed rubble masonry 2nd sort in cement mortar 1:4 including simultaneous pointing, finish with cement mortar 1:3 excluding cost and conveyance of cement. |        |                             |                     |                    |                     |
| Under abutments.                                                                                                                                                | 2      | 28-0                        | 5-6                 | 4-0                | 1232                |
| Under wings.                                                                                                                                                    | 4      | 4-9                         | 5-3                 | 4-0                | 399                 |
| Superstructure.                                                                                                                                                 | 2      | $\frac{28+4\frac{1}{2}}{2}$ | $\frac{5-0+2-0}{2}$ | 7-45               | 1877                |
| For Backwall over abutment.                                                                                                                                     | 2      | 24-0                        | 1-3                 | 0-7                | 35                  |
| For returns.                                                                                                                                                    | 2      | 23-0                        | 2-0                 | 0-10               | <u>77</u>           |
|                                                                                                                                                                 |        |                             |                     | Total. ...         | 3620                |
| Deduct for slab portion.                                                                                                                                        | 2      | 4-6                         | 2-0                 | 0-7                | <u>11</u>           |
|                                                                                                                                                                 |        |                             |                     | Net Total. 3620-11 | 3609                |
|                                                                                                                                                                 |        |                             |                     |                    | or <u>3650 Cft.</u> |

| 1. | 2 | 3 | 4 | 5 | 6. |
|----|---|---|---|---|----|
|----|---|---|---|---|----|

4) Coursed rubble masonry 1st sort in cement mortar

1:4 including simultaneous pointing, finish with cement mortar 1:3 excluding cost and conveyance of cement.

|                      |     |      |     |        |                    |
|----------------------|-----|------|-----|--------|--------------------|
| For parapets.        | 2   | 23-0 | 1-6 | 2-0    | 138                |
| Extra for pilasters. | 4-2 | 2-0  | 0-6 | 2-0    | 16                 |
|                      |     |      |     | Total. | 154                |
|                      |     |      |     |        | or <u>160 cft.</u> |

5) Vibrated cement concrete 1:2:4 with 3/4" B.S.S. hard granite metal using 4.08 lbs of steel per cu.ft., excluding cost and conveyance of cement and steel but inclusive of bending bars, tying grills, centering etc. complete.

|            |   |      |     |        |                   |
|------------|---|------|-----|--------|-------------------|
| Deck slab. | 1 | 28-0 | 4-6 | 0-7    | 74                |
|            |   |      |     | Total. | 74                |
|            |   |      |     |        | or <u>75 cft.</u> |

6) Vibrated Cement Concrete 1:1 1/2:3 mix with 65% of 1" size and 10% of 1/2" size I.R.C. hard granite metal excluding cost and conveyance of cement, but inclusive of tamping, finishing etc complete for wearing coat.

|                  |   |      |     |     |        |
|------------------|---|------|-----|-----|--------|
| Over Deck slabs. | 1 | 28-0 | 4-6 | 0-3 | 32 cft |
|------------------|---|------|-----|-----|--------|

7) Cement concrete 1:2:4 with 1 1/2" B.S.S. hard granite metal excluding cost and conveyance of cement but inclusive of shuttering etc. complete for coping over parapets.

|  |   |      |     |        |                   |
|--|---|------|-----|--------|-------------------|
|  | 2 | 23-0 | 2-0 | 0-6    | 46                |
|  |   |      |     | Total. | 46                |
|  |   |      |     |        | or <u>50 cft.</u> |

8) Supply of cement.

|                                             |                 |             |
|---------------------------------------------|-----------------|-------------|
| i) Foundation concrete.                     | 1090 x 24/96    | 273         |
| ii) C.R.Masonry 2nd sort.                   | 3650 x 32/4/100 | 292         |
| iii) C.R.Masonry 1st sort.                  | 160 x 28/4/100  | 11          |
| iv) R.C.C. for deck slab.                   | 75 x 24/96      | 19          |
| v) Cement concrete for coping over parapet. | 50 x 24/96      | 12          |
| vi) Hearing Cont.                           | 32 x 1/3        | 11          |
|                                             | Total.          | 619 Cft.    |
|                                             | or 24.76 T      | or 25 Tons. |

Supply of steel.

i) for deck slab. as per schedule.

300 lbs  
or 0.14 ton.

Jan 15/20

# ESTIMATE—DATA SHEET.

Name of work: Sub Estimate for Reconstructing the culvert at chainage 5420' of  
Udayavar Bridge approach.

| Quantity. | Description.                                                                                                                                                                | Rate     | Per       | Amount.         |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------|-----------------|
|           | 1) Earthwork excavation for foundation in ordinary soil including, shuttering, baling out of water etc. per 1000 Cft.                                                       |          |           |                 |
|           | Rate as per S.I.No.13A.                                                                                                                                                     | 27..8..0 | 1000 Cft. | 27..8..0        |
| L.S.      | For shuttering.                                                                                                                                                             |          |           | 25..0..0        |
| L.S.      | For baling out extra depth of water.                                                                                                                                        |          |           | 25..0..0        |
|           | Total.                                                                                                                                                                      |          |           | <u>77..8..0</u> |
|           | 2) Cement concrete 1:2:4 with 1½" B.S.S. hard granite metal excluding cost and conveyance of cement but inclusive of shuttering, baling out of water etc. per 100 Cft.      |          |           |                 |
| 100 Cft.  | 1½" B.S.S. metal.                                                                                                                                                           | 23..0..0 | 100 Cft.  | 23..0..0        |
| 50 Cft.   | Sand.                                                                                                                                                                       | 2..8..0  | 100 Cft.  | 1..4..0         |
| ½ No.     | Mason II Class.                                                                                                                                                             | 2.12.10  | each.     | 1..6..0         |
| 5 Nos.    | Men Handbars.                                                                                                                                                               | 1..8..0  | each.     | 7..8..0         |
| 4 Nos.    | Women Handbars.                                                                                                                                                             | 0.12..0  | each.     | 3..0..0         |
| 100 Cft.  | Lead 1 mile metalled road.                                                                                                                                                  | 7..0..6  | 100 Cft.  | 7..0..6         |
| L.S.      | Baling out of water etc.                                                                                                                                                    |          |           | 7..0..0         |
| L.S.      | Shuttering.                                                                                                                                                                 |          |           | 7..0..0         |
|           | Dundries.                                                                                                                                                                   |          |           | 0..5..6         |
|           | Total.                                                                                                                                                                      |          |           | <u>57..8..0</u> |
|           | 3) Coursed rubble masonry 2nd sort in Cement mortar 1:4 including simultaneous pointing finish with cement mortar 1:3 excluding cost and conveyance of cement- per 100 Cft. |          |           |                 |
| 110 Cft.  | C.R.Stones 2nd Sort including bond-stones.                                                                                                                                  | 28..0..0 | 100 Cft.  | 30.12.10        |
| 32 Cft.   | Sand.                                                                                                                                                                       | 2..8..0  | 100 Cft.  | 0.12.20         |

| 1.       | 2.                           | 3.       | 4.       | 5.              |
|----------|------------------------------|----------|----------|-----------------|
| 7 Nos.   | Mason II Class.              | 2..12..0 | each.    | 19..4..0        |
| 4 Nos.   | Men Hazdoors.                | 1..8..0  | each.    | 6..0..0         |
| 4 Nos.   | Women Hazdoors.              | 0.12..0  | each.    | 3..0..0         |
| 32 Cft.  | Mixing mortar.               | 4..8..0  | 100 Cft. | 1..7..0         |
| L.S.     | Pointing with cement mortar. |          |          | 2..0..0         |
| L.S.     | Scaffolding charges.         |          |          | 2..0..0         |
| L.S.     | Baling charges.              |          |          | 5..0..0         |
| 110 Cft. | C.R. Stones carted 1 Mile.   | 7..0..6  | 100 Cft. | 7..11..9        |
|          | Sundries.                    |          |          | 0..7..7         |
|          |                              |          | Total.   | <u>78..8..0</u> |

4) Coursed rubble masonry 1st Sort in cement mortar 1:4 including simultaneous pointing finish with cement mortar 1:3 excluding cost and conveyance of cement—per 100 Cft.

|          |                                             |          |          |                    |
|----------|---------------------------------------------|----------|----------|--------------------|
| 110 Cft. | C.R. Stones 1st sort including bond stones. | 38..0..0 | 100 Cft. | 41.12.10           |
| 28 Cft.  | Sand.                                       | 2..8..0  | 100 Cft. | 0.11. 2            |
| 10 Nos.  | Mason 2nd Class.                            | 2.12..0  | each.    | 27..8..0           |
| 4 Nos.   | Men Hazdoors.                               | 1..6..0  | each.    | <del>6.10..0</del> |
| 4 Nos    | Women mendoors.                             | 0.12..0  | each.    | 3..0..0            |
| 28 Cft.  | Mixing mortar.                              | 4..8..0  | 100 Cft. | 1..4..3            |
| L.S.     | Pointing with cement mortar.                |          |          | 2..0..0            |
| L.S.     | Scaffolding charges.                        |          |          | 2..0..0            |
| 110 Cft. | C.R. Stones carted 1 mile.                  | 7..0..6  | 100 Cft. | 7..11..9           |
|          | Sundries.                                   |          |          | 0..0..1            |
|          |                                             |          | Total.   | <u>92..0..0</u>    |

5) Vibrated cement concrete 1:2:4 with 3/4" B.S.S. hard granite metal excluding cost and conveyance of cement and steel for Reinforced concrete item—per cft. Quantities for 100 Cft.

|         |                    |          |          |          |
|---------|--------------------|----------|----------|----------|
| 96 Cft. | 3/4" B.S.S. metal. | 42..0..0 | 100 Cft. | 40..5..2 |
| 48 Cft. | Sand.              | 2..8..0  | 100 Cft. | 1..3..2  |

| 1.      | 2.                                  | 3.      | 4.       | 5               |
|---------|-------------------------------------|---------|----------|-----------------|
| 1 No.   | Mason 2nd Class.                    | 2.12.0  | each.    | 2..12..0        |
| 6 Nos.  | Men Handdoors.                      | 1.6..0  | each.    | 9...0..0        |
| 10 Nos. | Women Handdoors.                    | 0.12..0 | each.    | 7...3..0        |
| 96 Cft. | Conveyance of metal<br>1 mile road. | 7..0..6 | 100 Cft. | 6..12..0        |
| L.S.    | For Vibrated concrete work.         |         |          | 15..0..0        |
|         | Sundries.                           |         |          | 0..3..6         |
|         |                                     |         |          | <hr/>           |
|         |                                     | Total.  |          | <u>87.19..0</u> |

Rate per C.ft.  $\frac{82..12..0}{100}$  0..13..3

6. Vibrated Cement Concrete 1:2½:3 with 65% of 1" size, 25% of ½" size and 10% of ¼" size I.R.C. hard granite metal, excluding cost and conveyance of Cement, but inclusive of tamping, finishing etc complete for wearing coat.

|          |                                     |          |         |               |
|----------|-------------------------------------|----------|---------|---------------|
| 65 Cft.  | 1" Size metal I.R.Cs.               | 30..0..0 | 100Cft. | 19..8..0      |
| 25 Cft.  | ½" metal I.R.Cs.                    | 35..0..0 | 100Cft. | 13.12..0      |
| 10 Cft.  | ¼" Size metal I.R.Cs.               | 70..0..0 | 100Cft. | 7..0..0       |
| 50 Cft.  | Sand.                               | 2..8..0  | 200Cft. | 1..4..0       |
| 1 No.    | Mason I Class.                      | 3..2..0  | each.   | 3...2..0      |
| 6 Nos.   | Men Handdoors.                      | 1..8..0  | each.   | 9..0..0       |
| 10 Nos.  | Women Handdoors.                    | 0.12..0  | each.   | 7..8..0       |
| 3 Nos.   | Mason II Class for finishing.       | 2..13..0 | each.   | 6..4..0       |
| L.S.     | Add for vibrated concrete.          |          |         | 15..5..0      |
| 100 Cft. | Conveyance of metal 1 Mile by road. | 7...0..6 | 100Cft. | 7..0..6       |
|          | Sundries.                           |          |         | 8..1..6       |
|          |                                     |          |         | <hr/>         |
|          |                                     |          |         | <u>91-3-0</u> |

| 1.          | 2.                                                                                                                                                                                                                                                                    | 3.               | 4.        | 5.         |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------|------------|
| 1 No.       | Mason 2nd Class.                                                                                                                                                                                                                                                      | 2..12..0         | each.     | 2..12..0   |
| 6 Nos.      | Men Mazdoors.                                                                                                                                                                                                                                                         | 1...8..0         | each.     | 99..0..0   |
| 10 Nos.     | Women Mazdoors.                                                                                                                                                                                                                                                       | 0.12...0         | each.     | 7...8..0   |
| 96 Cft.     | Conveyance of metal<br>1 mile road.                                                                                                                                                                                                                                   | 7..0..6          | 100 Cft.  | 6..12..0   |
| L.S.        | For Vibrated concrete work.                                                                                                                                                                                                                                           |                  |           | 25..0..0   |
|             | Sundries.                                                                                                                                                                                                                                                             |                  |           | 0...3..8   |
|             | Total.                                                                                                                                                                                                                                                                |                  |           | 82..12..0  |
|             | Rate per C.Ft.                                                                                                                                                                                                                                                        | 82..12..0/100    | 0..13..3  |            |
|             | 6) Cement concrete 1;2;4 with 1½" B.S.S. hard<br>granite metal exclusive of cost and conveyance<br>of cement for coping over parapet-per 100 Cft.                                                                                                                     |                  |           |            |
|             | As per item (2)                                                                                                                                                                                                                                                       | 57..8..0         | 100 Cft.) | } 50..8..0 |
|             | Deduct for baling out water.                                                                                                                                                                                                                                          | 7..0..0          | 100 Cft.) |            |
|             | Per Cft.                                                                                                                                                                                                                                                              | 50..8..0/100     | 0..8..1   |            |
|             | Sundries.                                                                                                                                                                                                                                                             | 0..0..11         |           |            |
|             | Total.                                                                                                                                                                                                                                                                | 50..8..11        |           |            |
|             | 7) Vibrated cement concrete 1;2;4 mix with 3/8" size<br>B.S.S.hard granite metal using 4.08 lbs of steel per<br>cu.ft exclusive of cost and conveyance of cement and<br>steel but inclusive of cost of bending bars,tying<br>grills, centering etc. complete per Cft. |                  |           |            |
| 1 Cft.      | As per item (5)                                                                                                                                                                                                                                                       | 0..13..3         | Cft.      | 0..13..3   |
| 4.08 lbs.   | Tying grills.                                                                                                                                                                                                                                                         | 0...1..0         | lbs.      | 0...4..1   |
| 12/7 Sq.ft. | Centering.                                                                                                                                                                                                                                                            | S.I.39A 0..11..2 | Sq.ft.    | 1...3..4   |
|             | Sundries.                                                                                                                                                                                                                                                             |                  |           | 0...1..4   |
|             |                                                                                                                                                                                                                                                                       |                  |           | 2..6..0    |
|             | 8) Supply of cement//per Ton.                                                                                                                                                                                                                                         |                  |           |            |
| 1 Ton.      | Cement I.S.S.rate.                                                                                                                                                                                                                                                    | 72..0..0         | ton.      | 72..0..0   |
|             | Inspection charges 2%                                                                                                                                                                                                                                                 |                  |           | 1..7..0    |
|             | Sales tax 0.0.3 per Re.                                                                                                                                                                                                                                               |                  |           | 1..2..0    |
|             | Storage charges.                                                                                                                                                                                                                                                      |                  |           | 2..0..0    |
|             | Loading and unloading charges.                                                                                                                                                                                                                                        |                  |           | 2..0..0    |
|             | Railway freight from Madhukeral<br>to Mangalore.                                                                                                                                                                                                                      |                  |           | 15...2..0  |

| 1.      | 2                                                             | 3.        | 4.        | 5.               |
|---------|---------------------------------------------------------------|-----------|-----------|------------------|
| 24 Cft. | Conveyance from Mangalore to Bridge site 60 miles Via Udipi.  | 135.12.6  | 100 Cft.  | 32..9..5         |
|         | Fluctuation in I.S.D. rate.                                   |           |           | 10..0..0         |
|         | Sundries.                                                     |           |           | 0..0..7          |
|         |                                                               |           |           | <u>136..4..0</u> |
|         |                                                               | Total.    |           |                  |
| 1 Ton.  | 9) Supply of steel-per ton.<br>Steel I.S.D. rate.             | 480..0..0 | Ton.      | 480..0..0        |
|         | Inspection charges at 2%                                      |           |           | 9..9..7          |
|         | Sales tax 0.0.3 per Re.                                       |           |           | 7..8..0          |
|         | Storage charges.                                              |           |           | 2..0..0          |
|         | Loading and unloading charges.                                |           |           | 2..0..0          |
|         | Railway freight from Madras to Mangalore.                     |           |           | 47..0..0         |
|         | Conveyance from Mangalore to Bridge site, 60 miles Via Udipi. | 30.15..0  | 1000 lbs. | 69..4..10        |
|         | Fluctuation in I.S.D. rate.                                   |           |           | 15..0..0         |
|         | Sundries.                                                     |           |           | 0..9..7          |
|         |                                                               |           |           | <u>633..0..0</u> |
|         |                                                               | total.    |           |                  |

~~Certified that the leads allowed are correct to the best of my knowledge.~~

*Handwritten signature and date:*  
28/2/55  
D.P.

# ESTIMATE FORM-ABSTRACT.

Name of work: Sub Estimate for reconstructing the culvert at chainage 5420 of  
Udayavar Bridge approaches.

| Quantity. | Description of work.                                                                                                                                                                                                                      | Rate.     | Per.      | Amount.        |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|----------------|
| 5800 Cft. | 1) Earthwork excavation for foundation in ordinary soil including shuttering, baling out of water etc. complete.                                                                                                                          | 77..8..0  | 1000 Cft. | 450            |
| 1090 Cft. | 2) Cement concrete 1:2:4 with 1 1/2" B.S.S. hard granite metal excluding cost and conveyance of cement but incl. /<br>size of shuttering, baling out of water etc.                                                                        | 57..8..0  | 100 Cft.  | 627            |
| 3656 Cft. | 3) Coursed rubble masonry 2nd sort in cement mortar 1:4 including simultaneous pointing finish with cement mortar 1:3 excluding cost and conveyance of Cement.                                                                            | 78..8..0  | 100 Cft.  | 2865           |
| 160 Cft.  | 4) Coursed rubble masonry 1st sort in cement mortar 1:4 including simultaneous pointing finish with cement mortar 1:3 excluding cost and conveyance of cement.                                                                            | 92..0..0  | 100 Cft.  | 147            |
| 75 Cft.   | 5) Vibrated cement concrete 1:2:4 with 3/4" B.S.S. hard granite metal using 4.08 lbs of steel per Cft. excluding cost and conveyance of cement and steel, but inclusive of bedding bars, tying grills, centering etc. complete.           | 2..6..0   | Cft.      | 178            |
| 82 Cft.   | 6) Vibrated Cement concrete 1:1 1/2:3 mix with 65% of 1" size, 25% of 1/2" size and 10% of 3/4" size I.R.C. hard granite metal including cost and conveyance of cement but inclusive of tamping, finishing etc complete for wearing coat. | 92..8..0  | 100 Cft.  | 29             |
| 50 Cft.   | Cement concrete 1:2:4 with 1 1/2" B.S.S. hard granite metal excluding cost and conveyance of cement but inclusive of shuttering etc complete for coping.                                                                                  | 0..9..0   | Cft.      | 28             |
| 25.00 Ton | 8) Supply of Cement.                                                                                                                                                                                                                      | 136..4..0 | ton.      | 3406           |
| 0.14 Ton  | 9) Supply of steel.                                                                                                                                                                                                                       | 633..0..0 | ton.      | 89             |
| L.S       | 10) For foundation under pilasters in 1:4:8 concrete c/c                                                                                                                                                                                  |           |           |                |
|           |                                                                                                                                                                                                                                           |           | Total.    | 7859 or 8000/- |

*Handwritten signature and date: 28/11/55*

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REPORT TO ACCOMPANY THE SUB ESTIMATE FOR CONSTRUCTING A CULVERT AT  
CHAINAGE 3025' OF UDAYAVAR BRIDGE APPROACH.

Estimate. No. 13,450/-.

The approach road for the Udayavar Bridge crosses a small local and private irrigation channel at chainage 3025 ft. The existing width of the channel is 3ft. and so a 3' R.C. slab culvert is proposed to be constructed over it.

The soil is sandy loam even up to 12 ft. and so it is proposed to take the foundations only 6 ft. below sill level as this is considered safe enough from being scoured and also for the pressure which works out to about 1 ton per sq.ft.

Cement concrete 1:2:4 2 ft thick will be laid for the foundations as heavy springs are expected. The concrete for both the abutments will be laid in one block including the ventway portion as it is too narrow for the earth in between to stand by itself.

The masonry will be of coursed rubble 2nd sort in foundations and superstructure excepting for the parapets which will be of 1st sort. The width of masonry in foundation will be 7'0" and in substructure 6'6" at bottom reduced to 2'0" at top. The wings will be 14' 9" long and will have the same section as the abutment.

Over the abutments R.C. slab 2:2:4 7" thick with details of ~~reinforcement~~ reinforcement as shown in the drawing will be provided.

The parapets will be 1' 6" thick and 2' 6" high.

The clear roadway between parapets will be 24 ft.

The rates adopted are the current schedule of rates for South Kanara District.

The work will be carried out as per H.D.S.S. and other special specifications and circulars.

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# ESTIMATE DETAILED MEASUREMENT SHEET.

Sub Estimate for constructing a culvert at chainage 2025 of Udayavar Bridge approach.

| Details of work.                                                                                                                                                                                                               | Number. | Measurement in feet              |                              |            | Area or contents.                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------------------------------|------------------------------|------------|--------------------------------------------|
|                                                                                                                                                                                                                                |         | L                                | B                            | D          |                                            |
| 1) Earthwork excavation for foundation in ordinary soil including shuttering, baling out of water etc. complete.                                                                                                               |         |                                  |                              |            |                                            |
| a) Under abutments.                                                                                                                                                                                                            | 1       | 18-0                             | 29-0                         | 9-0        | 4692                                       |
| b) Under wings.                                                                                                                                                                                                                | 4       | 7-3                              | 8-0                          | 9-0        | <u>3088</u><br><u>8786</u>                 |
|                                                                                                                                                                                                                                |         |                                  |                              | Total.     | or <u>6200</u> Cft.                        |
| 2) Cement concrete 1:2:4 with 1½" B.S.S. hard granite metal exclusive of cost and conveyance of cement, but inclusive of shuttering, baling out of water etc.                                                                  |         |                                  |                              |            |                                            |
| a) Under abutments.                                                                                                                                                                                                            | 1       | 18-0                             | 29-0                         | 2-0        | 1044                                       |
| b) Under wings.                                                                                                                                                                                                                | 4       | 7-3                              | 8-0                          | 2-0        | <u>454</u><br><u>1508</u>                  |
|                                                                                                                                                                                                                                |         |                                  |                              | Total.     | or <u>1510</u> Cft.                        |
| 3) Coursed rubble masonry 2nd sort in cement mortar 1:4 including simultaneous pointing, finish with cement mortar 1:3 excluding cost and conveyance of cement.                                                                |         |                                  |                              |            |                                            |
| Under abutments.                                                                                                                                                                                                               | 2       | 28-0                             | 7-0                          | 4-0        | 1568                                       |
| Under wings.                                                                                                                                                                                                                   | 4       | 8-0                              | 6-9                          | 4-0        | 864                                        |
| Superstructure.                                                                                                                                                                                                                | 2       | <u>31' 6" + 53-6</u><br><u>2</u> | <u>6-6 + 2-0</u><br><u>2</u> | 11.90      | 4299                                       |
| For Backwall over abutment.                                                                                                                                                                                                    | 2       | 24-00                            | 1-3                          | 0-7        | 35                                         |
| For returns.                                                                                                                                                                                                                   | 2       | 32-6                             | 2-0                          | 0-10       | <u>109</u><br><u>6875</u>                  |
| Deduct for slab portion.                                                                                                                                                                                                       | 2       | 4-6                              | 2-0                          | 0-7        | 11                                         |
|                                                                                                                                                                                                                                |         |                                  |                              | Net Total. | <u>6864</u> or <u>6200</u> Cft.            |
| 4) Coursed rubble masonry 1st sort in cement mortar 1:4 including simultaneous pointing, finish with cement mortar 1:3 excluding cost and conveyance of cement.                                                                |         |                                  |                              |            |                                            |
| For parapets.                                                                                                                                                                                                                  | 2       | 32-6                             | 1-6                          | 2-0        | 195                                        |
| Extra for pilasters.                                                                                                                                                                                                           | 4x2     | 2-0                              | 0-6                          | 2-0        | <u>16</u><br><u>211</u> or <u>220</u> Cft. |
|                                                                                                                                                                                                                                |         |                                  |                              | Total.     |                                            |
| 5) Vibrated cement concrete 1:2:4 with ¾" B.S.S. hard granite metal using 4.08 lbs of steel per cu.ft excluding cost and conveyance of cement and steel, but inclusive of bending bars, tying grills, centering etc. complete. |         |                                  |                              |            |                                            |

| 1                                                                                                                                                                                                                             | 2                                       | 3    | 4      | 5      | 6.                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------|--------|--------|----------------------------------------------|
| Deck slab.                                                                                                                                                                                                                    | 1                                       | 28-0 | 4-6    | 0-7    | 76 or<br>75 cft.                             |
| 6) Cement concrete 1:1½:3 mix with 65% of 1" Size and 25% of ½" size and 10% of ¼" size I.R.C. hard granite metal excluding cost and conveyance of cement, but inclusive of tamping, finishing etc complete for wearing coat. |                                         |      |        |        |                                              |
| Over deck slabs.                                                                                                                                                                                                              | 1                                       | 28-0 | 4-6    | 0-3    | 31.5 cft<br>or<br>32 cft.                    |
| 7) Cement concrete 1:2:4 with 1½" B.S.S. hard granite metal exclusive of cost and conveyance of cement but inclusive of shuttering etc. complete for coping.                                                                  |                                         |      |        |        |                                              |
| Over parapets.                                                                                                                                                                                                                | 2                                       | 32-6 | 2-0    | 0-6    | 65                                           |
|                                                                                                                                                                                                                               |                                         |      |        | Total. | <u>65 or 70 cft</u>                          |
| 8) Supply of cement.                                                                                                                                                                                                          |                                         |      |        |        |                                              |
| i) Foundation concrete.                                                                                                                                                                                                       | $\frac{1510 \times 24}{96}$             |      |        |        | 377.50 cft.                                  |
| ii) C.R.Masonry 2nd sort.                                                                                                                                                                                                     | $\frac{6900 \times 22\frac{1}{4}}{100}$ |      |        |        | 528.00 cft.                                  |
| iii) C.R.Masonry 1st sort.                                                                                                                                                                                                    | $\frac{220 \times 23\frac{1}{4}}{100}$  |      |        |        | 25.40 cft.                                   |
| iv) R.C.C. for deck slab.                                                                                                                                                                                                     | $75 \times 24/96$                       |      |        |        | 18.75 cft.                                   |
| v) Cement concrete for coping over parapet.                                                                                                                                                                                   | $70 \times 24/96$                       |      |        |        | 17.50 cft.                                   |
| vi) For wearing coat.                                                                                                                                                                                                         | $32 \times 33 \frac{2}{3} / 100$        |      |        |        | <u>10.67 cft.</u>                            |
|                                                                                                                                                                                                                               |                                         |      | Total. |        | 991.83 cft<br>992 cft. or<br><u>10 Tons.</u> |
| 9) Supply of steel.                                                                                                                                                                                                           |                                         |      |        |        |                                              |
| i) For deck slab.                                                                                                                                                                                                             | as per schedule.                        |      |        |        | 300 lbs<br>6.14 T.                           |

# ESTIMATE--DATA SHEET

Name of work: Sub Estimate for constructing a culvert at chainage 3025 of Udayavar  
Bridge approach.

| Quantity.                                                                                                                                                                  | Description of work.                          | Rate.     | Per.     | Amount.   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-----------|----------|-----------|
| 1) Earthwork excavation for foundation in ordinary soil including shuttering, baling out of water etc. per 1000 Cft.                                                       |                                               |           |          |           |
| 1000 Cft.                                                                                                                                                                  | Rate as per S.I.No.13A.                       | 27..8..0  | 1000Cft. | 27..8..0  |
| L.S.                                                                                                                                                                       | For shuttering.                               |           |          | 25..0..0  |
| L.S.                                                                                                                                                                       | For baling out extra depth of water.          |           |          | 25..0..0  |
|                                                                                                                                                                            | Total.                                        |           |          | 77..8..0  |
| 2) Cement concrete 1:2:4 with 1½" B.S.S. hard granite metal excluding cost and conveyance of cement but inclusive of shuttering, baling out of water etc. per 100 Cft.     |                                               |           |          |           |
| 100 Cft.                                                                                                                                                                   | 1½" B.S.S. metal.                             | 23..0..0  | 100 Cft. | 23..0..0  |
| 50 Cft.                                                                                                                                                                    | Sand.                                         | 2..8..0   | 100 Cft. | 1..4..0   |
| ½ No.                                                                                                                                                                      | Mason II Glass.                               | 2..12..0  | each.    | 1..6..0   |
| 5 Nos.                                                                                                                                                                     | Man Handdoors.                                | 1..8..0   | each.    | 7..2..0   |
| 4 Nos.                                                                                                                                                                     | Women Handdoors.                              | 0..12..0  | each.    | 3..0..0   |
| 100 Cft.                                                                                                                                                                   | Lead 1½ mile metallad Road and 0-½ mile boat. | 12..14..3 | 100 Cft. | 12..14..3 |
| L.S.                                                                                                                                                                       | Baling out of water etc.                      |           |          | 7..0..0   |
| L.S.                                                                                                                                                                       | Shuttering.                                   |           |          | 7..0..0   |
|                                                                                                                                                                            | Sundries.                                     |           |          | 0..3..2   |
|                                                                                                                                                                            | Total.                                        |           |          | 63..4..0  |
| 3) Coursed rubble masonry 2nd sort in cement mortar 1:4 including simultaneous pointing finish with cement mortar 1:3 excluding cost and conveyance of cement per 100 Cft. |                                               |           |          |           |
| 110 Cft.                                                                                                                                                                   | C.R.stones 2nd sort including bond stones.    | 28..0..0  | 100 Cft. | 30..12..0 |
| 32 Cft.                                                                                                                                                                    | Sand.                                         | 2..8..0   | 100 Cft. | 0..12..0  |
| 7 Nos.                                                                                                                                                                     | Mason II Glass.                               | 2..12..0  | each.    | 19..4..0  |
| 4 Nos.                                                                                                                                                                     | Man Handdoors.                                | 1..8..0   | each.    | 6..0..0   |
| 4 Nos.                                                                                                                                                                     | Women Handdoors.                              | 0..12..0  | each.    | 3..0..0   |
| 32 Cft.                                                                                                                                                                    | Mixing mortar.                                | 4..6..0   | 100Cft.  | 1..7..0   |

| 1.       | 2                                                                             | 3        | 4        | 5.              |
|----------|-------------------------------------------------------------------------------|----------|----------|-----------------|
| L.S.     | Pointing with cement mortar.                                                  |          |          | 2..0..0         |
| L.S.     | Scaffolding charges.                                                          |          |          | 2..0..0         |
| L.S.     | Baling charges.                                                               |          |          | 5..0..0         |
| 110 Cft. | C.R. Stones carted $1\frac{1}{2}$ miles and<br>0- $\frac{1}{2}$ mile by boat. | 12.14.3  | 100 Cft. | 14..2..11       |
|          | Sundries.                                                                     |          |          | 0..4..5         |
|          |                                                                               | Total... |          | <u>85.12..0</u> |

4) Coursed rubble masonry 1st sort in cement mortar  
1:4 including simultaneous pointing, finish with cement  
mortar 1:3 excluding cost and conveyance of cement—  
per 100 Cft.

|          |                                                                                  |          |          |                                   |
|----------|----------------------------------------------------------------------------------|----------|----------|-----------------------------------|
| 110 Cft. | C.R. Stones 1st sort including bond<br>stones.                                   | 38..0..0 | 100 Cft. | 41.12.10                          |
| 28 Cft.  | Sand.                                                                            | 2..8..0  | 100 Cft. | 0.11..2                           |
| 10 Nos.  | Mason 2nd Class.                                                                 | 2.12..0  | each.    | 27..8..0                          |
| 4 Nos.   | Men Mazdoors.                                                                    | 1..8..0  | each.    | 6..0..0                           |
| 4 Nos.   | Women Mazdoors.                                                                  | 0.12..0  | each.    | 3..0..0                           |
| 28 Cft.  | Mixing mortar.                                                                   | 4..8..0  | 100 Cft. | 1..8..2                           |
| L.S.     | Pointing with cement mortar.                                                     |          |          | 27..0..0                          |
| L.S.     | Scaffolding charges.                                                             |          |          | 2..0..0                           |
| 110 Cft. | C.R. Stones $1\frac{1}{2}$ mile metalled road<br>and 0- $\frac{1}{2}$ mile boat. | 12.14.3  | 100 Cft. | 14.2..11                          |
|          | Sundries.                                                                        |          |          | 0..0..11                          |
|          |                                                                                  |          | Total.   | <u>98..8..8</u><br><del>111</del> |

5) Vibrated cement concrete 1:2:4 with  $\frac{3}{4}$ " B.S.S.  
hard granite metal excluding cost and conveyance  
of cement and steel for reinforced concrete item  
per cft. Quantities for 100 Cft.

|         |                                                                                           |          |          |                |
|---------|-------------------------------------------------------------------------------------------|----------|----------|----------------|
| 96 Cft. | $\frac{3}{4}$ " B.S.S. metal.                                                             | 42..0..0 | 100 Cft. | 40..5..2       |
| 48 Cft. | Sand.                                                                                     | 2..8..0  | 100 Cft. | 1..3..2        |
| 1 No.   | Mason 2nd class.                                                                          | 2..12..0 | each.    | 2.12..0        |
| 6 Nos.  | Men Mazdoors.                                                                             | 1..8..0  | each.    | 9..0..0        |
| 10 Nos. | Women Mazdoors.                                                                           | 0..12..0 | each.    | 7..8..0        |
| 96 Cft. | Conveyance of metal $1\frac{1}{2}$ miles metalled road<br>and 0- $\frac{1}{2}$ mile boat. | 12.14.3  | 100 Cft. | 12..6..0       |
| L.S.    | For Vibrated concrete work.                                                               |          |          | 15..0..0       |
|         | Sundries.                                                                                 |          |          | 0..5..8        |
|         | Rate per Cft. 88.12.0/100                                                                 | 0.14.2   | Total.   | <u>88.12.0</u> |

| 1. | 2 | 3 | 4 | 5 |
|----|---|---|---|---|
|----|---|---|---|---|

6) Vibrated Cement concrete 1:1½:3 with 65% of 1" size, 25% of ½" size and 10% of ¼" size. I.R.C. hard granite metal excluding cost and conveyance of cement, but inclusive of tamping finishing etc complete for wearing coat.

|          |                                                                |          |           |                 |
|----------|----------------------------------------------------------------|----------|-----------|-----------------|
| 65 Cft.  | 1" Size metal I.R.C.                                           | 30..0..0 | 100 Cft.  | 19..8..0        |
| 25 Cft.  | ½" size metal I.R.C.                                           | 55.60..0 | 100 Cft.  | 13.12..0        |
| 10 Cft.  | ¼" size metal I.R.C.                                           | 70..0..0 | 100 Cft.  | 7..0..0         |
| 50 Cft.  | Sand.                                                          | 2..8..0  | 100 Cft.  | 1..4..0         |
| 1 No.    | Mason I Class.                                                 | 3..2..0  | each.     | 3..2..0         |
| 6 Nos.   | Men Handdoors.                                                 | 1..8..0  | each.     | 9..0..0         |
| 10 Nos.  | Women Handdoor.                                                | 0.12..0  | each.     | 7..8..0         |
| 3 Nos.   | Mason II Class for finishing.                                  | 2112..0  | each.     | 8..4..0         |
| L.S.     | Add for vibrated concrete.                                     |          |           | 15..0..0        |
| 100 Cft. | Metal conveyance 1½ miles by metalled road and ½ mile by boat. | 12.14.3  | 1000 Cft. | 12.14.3         |
|          | Sundries                                                       |          |           | 0..3..9         |
|          |                                                                |          |           | <u>97..8..0</u> |

7) Cement concrete 1:2:4 with 1½" B.S.S. hard granite metal exclusive of cost and conveyance of cement for coping over parapets, per 100 Cft.

|                              |          |          |   |          |
|------------------------------|----------|----------|---|----------|
| As per item (2)              | 63..4..0 | 100 Cft. | 0 | 36..4..0 |
| Deduct for baling out water. | 7..0..0  | 100 Cft. | 1 |          |

Per Cft. 56..4..0/100 0..9..0

8) Vibrated cement concrete 1:2:4 mix with 3/4" size B.S.S. hard granite metal using 4.06 lbs of steel per cu.ft exclusive of cost and conveyance of cement and steel but inclusive of cost of bending bars, tying grills, centering etc. complete for deck slab. per cuft.

|            |                    |          |        |                |
|------------|--------------------|----------|--------|----------------|
| 1 Cft.     | As per item (5)    | 0..24..2 | Cft.   | 0..24..2       |
| 4.06 lbs.  | Tying grills etc.  | 0..1..0  | lbs.   | 0..4..1        |
| 12/7 Sqft. | Centering. S.I.39A | 0..11..3 | Sq.ft. | 1..3..4        |
|            | Sundries.          |          |        | 0..8..5        |
|            |                    |          | Total. | <u>2..6..0</u> |

| 1.      | 2                                                                                   | 3         | 4.        | 5.               |
|---------|-------------------------------------------------------------------------------------|-----------|-----------|------------------|
|         | 9) Supply of Cement per ton.                                                        |           |           |                  |
| 1 ton.  | Cement I.S.D. rate.                                                                 | 72..0..0  | ton.      | 72..0..0         |
|         | Inspection charges. 2%                                                              |           |           | 1..7..0          |
|         | Sales tax 0.0.3 per Re.                                                             |           |           | 1..2..0          |
|         | Storage charges.                                                                    |           |           | 2..0..0          |
|         | Loading and unloading charges.                                                      |           |           | 2..0..0          |
|         | Railway freight from Madhukarai to Mangalore.                                       |           |           | 15..1..0         |
| 24 Crt. | Conveyance from Mangalore to Bridge site 60½ miles Via Udupi, and 0-½ mile by boat. | 340..4..9 | 100 Crt.  | 33..10..9        |
|         | Fluctuation in I.S.D. rate.                                                         |           |           | 10..0..0         |
|         | Sundries.                                                                           |           |           | 0..11..3         |
|         |                                                                                     | Total.    |           | <u>138..0..0</u> |
|         | 10) Supply of steel per ton.                                                        |           |           |                  |
| 1 ton.  | Steel I.S.D. rate.                                                                  | 480..0..0 | ton.      | 480..0..0        |
|         | Inspection charges at 2%                                                            |           |           | 9..9..7          |
|         | Sales tax 0.0.3 per Re.                                                             |           |           | 7..8..0          |
|         | Storage charges.                                                                    |           |           | 2..0..0          |
|         | Loading and unloading charges.                                                      |           |           | 2..0..0          |
|         | Railway freight from Madras to Mangalore.                                           |           |           | 47..0..0         |
|         | Conveyance from Mangalore to site; 60½ miles installed road and 0-½ mile by boat.   | 31..14..0 | 1000 lbs. | 71..6..5         |
|         | Fluctuation in I.S.D. rate.                                                         |           |           | 15..0..0         |
|         | Sundries.                                                                           |           |           | 0..3..0          |
|         |                                                                                     |           |           | <u>635-0-0</u>   |

Certified that the leads allowed are correct to the best of my knowledge.

ESTIMATE ABSTRACT OF ESTIMATE.

Name of work: Sub Estimate for reconstructing the culvert at chainage 3025 of  
Udayavar Bridge approach.

| Quantity. | Description of work.                                                                                                                                                                                                                                | Rate    | Per       | Amount. |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----------|---------|
| 6300 Cft. | 1) Earth work excavation for foundation in ordinary soil including shuttering, baling out of water etc.                                                                                                                                             | 77.8.0  | 1000 Cft. | 527     |
| 1510 Cft. | 2) Cement concrete 1:2:4 with 1½" B.S.S. hard granite metal excluding cost and conveyance/including shuttering, baling out of water etc for foundation.                                                                                             | 63.4.0  | 100 Cft.  | 955     |
| 6900 Cft. | 3) Coursed rubble masonry 2nd sort in cement mortar 1:4 including simultaneous pointing, finish with cement mortar 1:3 excluding cost and conveyance of cement for abutment and wings.                                                              | 84.12.0 | 100 Cft.  | 5848    |
| 220 Cft.  | 4) Coursed rubble masonry 1st sort in cement mortar 1:4 including simultaneous pointing, finish with cement mortar 1:3 including cost and conveyance of cement for parapets.                                                                        | 92.8.0  | 100 Cft.  | 217     |
| 75 Cft.   | 5) Vibrated cement concrete 1:2:4 with 3/4" B.S.S. hard granite metal using 4.08 lbs of steel per cubic foot, excluding cost and conveyance of cement and steel, but inclusive of bending bars, tying grills, centering etc complete for deck slab. | 2.6.0   | Cft.      | 178     |
| 32 Cft.   | 6) Vibrated Cement concrete 1:1½:3 mix with 65% of 1" size, 25% of ½" size and 10% of ¼" size I.R.C. hard granite metal excluding cost of cement and steel, but inclusive of tamping, finishing etc complete for wearing coat.                      | 97.8.0  | 100 Cft.  | 31      |
| 70 Cft.   | 7) Cement concrete 1:2:4 with 1½" B.S.S. hard granite metal excluding cost and conveyance of cement but inclusive of shuttering etc. complete for coping over parapets.                                                                             | 0.9.0   | Cft.      | 39      |
| 40 Tons.  | 8) Supply of cement.                                                                                                                                                                                                                                | 138.0.0 | Ton.      | 5520    |
| 0.14 Ton. | 9) Supply of steel.                                                                                                                                                                                                                                 | 635.0.0 | Ton.      | 89      |
| 1.3.      | 10) For foundations under pilasters in 1:4:8 concrete.                                                                                                                                                                                              |         |           |         |

Rs.

46  
23450/-

254/55



**CONSTRUCTING A BRIDGE ACROSS UDAYAVAR RIVER AT MILE 33/5 OF MANGALORE  
BAINDUR COAST ROAD.**

**HYDRAULIC CALCULATIONS:-**

The maximum discharge will be calculated by empirical (Ryves) formula as well as the catchment run off (theoretical) method and the greater of the two values taken for design purposes. The usual method of calculating the discharge by the cross-section and the bed slope method is inapplicable in this case as it is a river subjected to tidal action, wide and shallow in some places and meandering.

**I. MAXIMUM DISCHARGE BY EMPIRICAL (RYVES) FORMULA & - CN 2/3**

C is assumed as 1500 as this is found to be suitable for the locality. The catchment area K is found to be 116 square miles from the ordinance maps.

$$Q = 1500 \times 116^{2/3} = 35680 \text{ cusecs.}$$

**II. CATCHMENT RUN-OFF (THEORETICAL) METHOD.**

In the catchment there will be intense and prolonged rainfall and as an intensity of 5" per hour will be assumed as suggested in para 4.5 of paper No.167 of I.R.C. since statistics about the actual intensity are not available.

$$\begin{array}{ll} \text{That is} & I_0 \text{ 5"} \\ \text{Time of} & \\ \text{concentration} & t_0 \left( 11.9 \times \frac{L^3}{H} \right) = 0.385 \end{array}$$

Difference in level from Source to site H = 250 ft  
Length of river from source to site L = 27 miles

Here L = 27 miles and H = 250 ft

$$\text{Therefore } t_0 = \left( \frac{11.9 \times 27^3}{250} \right) = 0.385 \text{ 13.94}$$

$$\text{Therefore } I_c = 5 \times \frac{2}{19.94 + 1} = 0.67 \text{ inches}$$

The fraction 'f', to get the mean intensity, is found to be 0.62 for 116 x 640 74240 cusecs, from the statistical chart given in fig. 4 - 10 of I.R.C. paper No.167.

The coefficient of run-off 'p' will be assumed as 0.70 as the catchment is mainly lightly covered plateau.

$$Q = \frac{0.70 \times 0.62 \times 0.67 \times 116 \times 5280 \times 5280}{12 \times 60 \times 60} = 35060 \text{ cusecs.}$$

The discharge arrived at by the empirical formula (Ryve's) is found to be more and this will be adopted for design purposes.

**DESIGN OF LINEAL WATERWAY.**

As the bed of the river is sandy the wetted perimeter (p) required for a given discharge 'Q' may be obtained from Lacey's formula P 2.67Q<sup>2/3</sup>  
 $2.67 \times 35680^{2/3} = 504 \text{ ft}$

A lineal waterway of 9 x 90 = 810 ft is provided against this. Out of this one span will be ineffective. The useful lineal water way will be 8 x 90 = 720ft

**VELOCITY.**

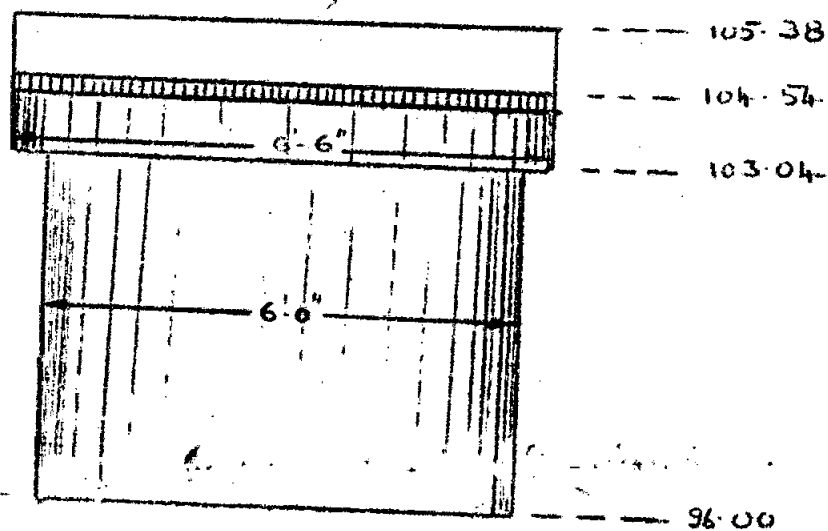
The normal depth of scour as given by Lacey is,  
 $D = 0.473 \left( \frac{Q}{f} \right)^{1/3}$

The sand in the river being medium the silt factor  
 $f = 1.125$   
 $d = 0.473 \times \left( \frac{35680}{1.125} \right)^{1/3} = 14.97$

Therefore Velocity

$$\begin{aligned} V &= \frac{Q}{A} = \frac{35680}{.9 \times 720 \times 14.97} \\ &= 3.68 \text{ feet per second} \end{aligned}$$

## DESIGN OF PIER



### 1) DATA

Straight length of pier 21.0'  
 Cut water will be semicircular  
 The pier will be designed for the possible combinations of any of the following forces:-

- a) Live and dead loads from superstructure
- b) Weight of pier
- c) Wind pressure
- d) Force due to water current
- e) Longitudinal force due to tractive or braking effort

NOTE:- Buoyancy will not be considered in the design as the piers are founded on rock.

### 2) LOAD AND STRESSES

I. (a) Dead load from superstructure (from the design of deck)

|                                    |                  |                   |
|------------------------------------|------------------|-------------------|
| i) Dead load uniformly distributed | $7864 \times 96$ | $= 7,55,000$ lbs  |
| ii) Diaphragms                     | $4 \times 8328$  | $= 33,312$ "      |
| iii) End Diaphragms                | $2 \times 11770$ | $= 23,540$ "      |
|                                    |                  | <u>8,13,852</u> " |

(b) Live load from superstructure (vide capping slab design)

2,07,300 "

Total Dead and Live loads

10,21,152 lbs or 456.0 Tons

### IV. WEIGHT OF PIER

i) Bed block, considering pier carrying

fixed ends  $= (21 \times 6.5 \times 2'4")$

$+ \pi \times \frac{6.5}{4} \times 1.25 \times 150 = 54030$

ii) Pier

$21 \times 6 + \pi \times \frac{6^2}{4} \times 7.05 = 152058$

206088 or 92.00 Tons

Total direct loads at base of pier due to dead and live loads from superstructure and self weight of pier

$456.0 + 92.00$

$= 548.00$  Tons

Stress at base of pier due to the above loads, (ignoring the cut water portions)

$= \frac{548.00}{6 \times 21}$

$= 4.35$  T./Sq.ft

### III. WIND PRESSURE

Wind pressure will be assumed as 300 lbs per lineal foot of deck

Force due to wind pressure  $\frac{96 \times 300}{2240} = 12.86$  T.

Acting at level (say)

109.00

Moment about base due to

wind pressure

$12.86 \times (109.00 - 96.00)$

$167.18$  ft. tons

Stress at base due to wind press

$\frac{M.Y.}{I} = \frac{167.18 \times 21}{2}$

$\frac{1}{12} \times 6 \times 21^3 = \pm 0.379$  T.sq.ft

#### IV. (a) FORCE DUE TO WATER CURRENT

Velocity as per hydraulic

Calculations

Force due to water  
current

$$3.84 \text{ /Sec. or } 4 \text{ /Sec.}$$

$$= K \times A \times V^2$$

$$= 0.66 \times 6 \times 5.50 \times \frac{4^2 \times 1}{2240}$$

$$= 0.155 \text{ Ton}$$

Moment about base

$$= 0.155 \times 5.50 \times 2/3$$

$$0.5683 \text{ ft. Tons}$$

Stress at base

$$= 0.5683 \times \frac{21 \times 12}{2 \times 21^3 \times 6}$$

$$= \pm 0.0013 \text{ T./Sq.ft.}$$

#### b) FORCE DUE TO CROSS CURRENT

$$= 1/5 \times 0.66 \times 27 \times 5.5 \times \frac{4^2 \times 1}{2240}$$

$$= 0.24 \text{ Ton}$$

Moment about base

$$= 0.24 \times 5.5 \times 2/3$$

$$= 0.51 \text{ Ft. Tons}$$

Stress at base

$$= 0.51 \times \frac{6}{21 \times 6^2}$$

$$= \pm 0.004 \text{ t./Sq.ft}$$

#### V. LONGITUDINAL FORCE DUE TO TRACTION:

$$5 + 0.124$$

$$5 + 0.12 \times 96 = 16.52 \text{ Tons}$$

That is acting at

Lever arm

$$105.5 - 96.00 = 9.5$$

Moment

$$16.52 \times 9.5 = 156.9 \text{ Ton}$$

Stress at base

$$\frac{156.9 \times 6}{21 \times 6^2} = \pm 1.24 \text{ T./Sq.ft}$$

#### Summary of Stresses:

##### a) Under H.F.L. conditions

(i) Dead and live loads and weight  
of Pier

$$= 4.350$$

(ii) Wind pressure

$$= \pm 0.379$$

(iii) Force due to water current

$$= \pm 0.001$$

(iv) Force due to cross current

$$= \pm 0.004$$

(v) Force due to traction

$$= \pm 1.24$$

Maximum

$$5.9/4 \text{ T./Sq.ft}$$

Minimum

$$2.726 \text{ T./Sq.ft}$$

##### b) Under low Tide conditions

(i.e. when the water level goes to the bottom of pier)

(i) D.L. and L.L. and weight of pier

$$4.350$$

(ii) Wind pressure

$$= \pm 0.379$$

(iii) Force due to traction

$$= \pm 1.24$$

Maximum

$$5.969 \text{ T./Sq.ft}$$

Minimum

$$2.731 \text{ T./Sq.ft}$$

Hence the design is safe

**DATA.**

## h - 8.54

 $a = 8.21$ 

~~5~~ 529

$$h+a = 16.75$$

|                      |              |                 |
|----------------------|--------------|-----------------|
| 1) U. G. L.          | (7864 x 48)  | 3,78,000        |
| 11) Centre Diaphragm | ( 2 x 8820)  | 17,656          |
| 111) End Diaphragm   |              | 11,770          |
|                      | <b>Total</b> | <b>4,07,426</b> |

4,07,426  
21

= 19401 lbs

**Weight**

- |      |                                      |              |
|------|--------------------------------------|--------------|
| i)   | $2 \times 8.21 \times 140$           | 22.99        |
| ii)  | $3/2 \times 8.21 \times 140$         | 1724         |
| iii) | $8 \times 8.54 \times 140$           | 9565         |
| iv)  | $\frac{1}{2} \times 5.54 \times 140$ | 388          |
| v)   | $1 \times 3 \times 140$              | 420          |
| vi)  | $\frac{1}{2} \times 1 \times 140$    | 70           |
| vii) | $1 \times 2 \times 140$              | 280          |
|      | <b>Total</b>                         | <b>14746</b> |

**Total**

| Section        | Weight       | Distance from A | Moment about A |
|----------------|--------------|-----------------|----------------|
| i.             | 2299         | 6'              | 13794          |
| ii             | 1724         | 8'              | 13792          |
| iii            | 9565         | 6'              | 57390          |
| iv             | 383          | 1 2/3           | 647            |
| v              | 420          | 1 1/2'          | 630            |
| vi             | 70           | 2/3'            | 47             |
| vii            | 280          | 1/2'            | 140            |
| Load due       |              |                 |                |
| Superstructure | <u>19401</u> | 3 1/2'          | <u>67904</u>   |
|                | <u>34147</u> |                 | <u>154344</u>  |

C.G. of the vertical forces acts at

= 4.52 from A

#### IV. EARTH PRESSURE

This will be calculated as per Coulomb's theory.

$$P = \frac{wh^2}{2} \times \frac{\sin^2(\theta - \phi)}{\sin^2 \theta \sin(\theta + z) \left\{ 1 + \sqrt{\frac{\sin(z + \phi) \sin(\phi - d)}{\sin(\theta + z) \sin(\theta - d)}} \right\}^2}$$

Where  $\theta = 90^\circ$ ,  $\phi = 35^\circ = z$ ;  $d = 0$

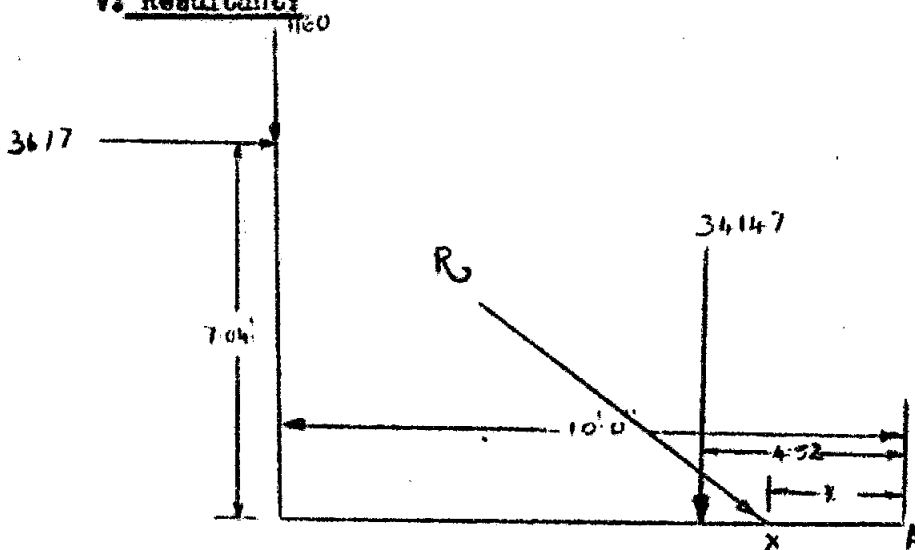
By simplifying:

$$\begin{aligned} P &= 0.1249 wh^2 \\ P_1 &= w(h_1)^2 \times 0.1249 \\ &= 0.1249 \times 110 \times 16.75^2 \\ &= 3855 \text{ acting at } 0.42 \times 16.75 = 7.04' \text{ from base} \end{aligned}$$

$\Sigma$   $wh$

$$\begin{aligned} \text{Horizontal Component} &= 3855 \times \cos 17.1^\circ = 3677 \\ \text{Vertical Component} &= 3855 \times \sin 17.1^\circ = 1160 \end{aligned}$$

V. Resultant:



Taking Moments about X

$$\begin{aligned} 1160(10-x) + 3677(4.52-x) &= 3677 \times 7.04 \\ 11600 - 1160x + 15434.4 - 3677x &= 25886 \\ &= 25886 \end{aligned}$$

$$x = \frac{14005.2}{3537} = 3.97$$

The resultant falls within the middle third and hence safe

## DESIGN OF CAPPING SLAB OVER WELLS

### I. OVER PIER WELLS

Super load on wells

1) Dead load uniformly distributed

$$7864 \times 96 = 7,55,000 \text{ lbs}$$

2) Diaphragms

$$5 \times 8828 = 35,312 \text{ lbs}$$

3) End diaphragms

$$2 \times 11,770 = 23,540 \text{ lbs}$$

4) Bed Blocks (fixed end Bearing)

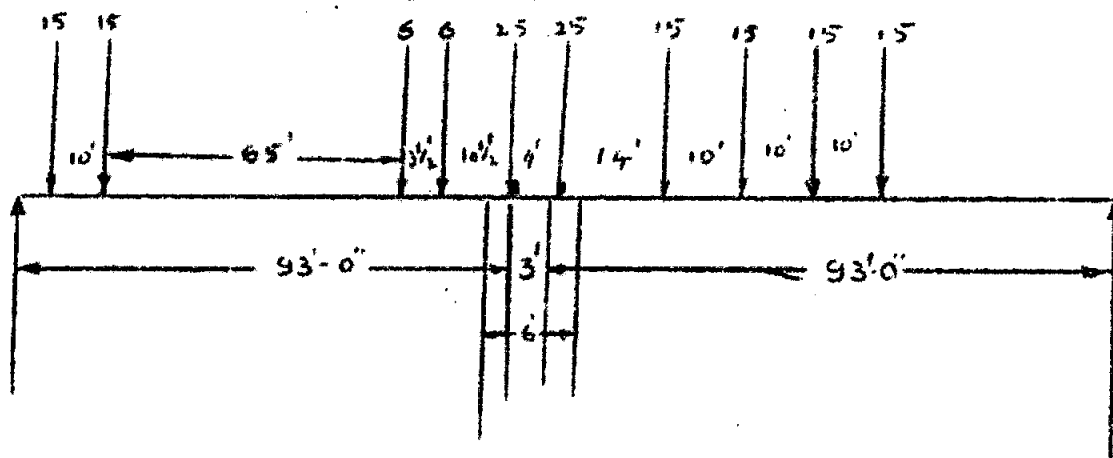
$$105.38 \text{ to } 103.04 = (21 \times 6.5 \times 21 + 22/7 \times 6.5^2 \times 1.25) \times 150$$

$$= 54,000 \text{ lbs}$$

$$5) \text{ Pier } (103.04 - 96.00) = (21 \times 6 + 22/7 \times 6^2) \times 7.04 \times 140$$

$$= 152,078 \text{ lbs}$$

6) Live load reaction from adjacent spans:-



$$\frac{25(1 + \frac{92}{93}) + 15(78 + 68 + 58 + 18 + 14 + 4) + 6(72 + 82.5)}{93} = 103.67 \text{ kips}$$

Therefore for 2 lanes  $2 \times 103.67 \times 1000 = 2,07,300 \text{ lbs}$

Total super load on well cap  $122,7230 \text{ lbs}$

Load per square foot on well cap assuming  $45^\circ$  dispersion

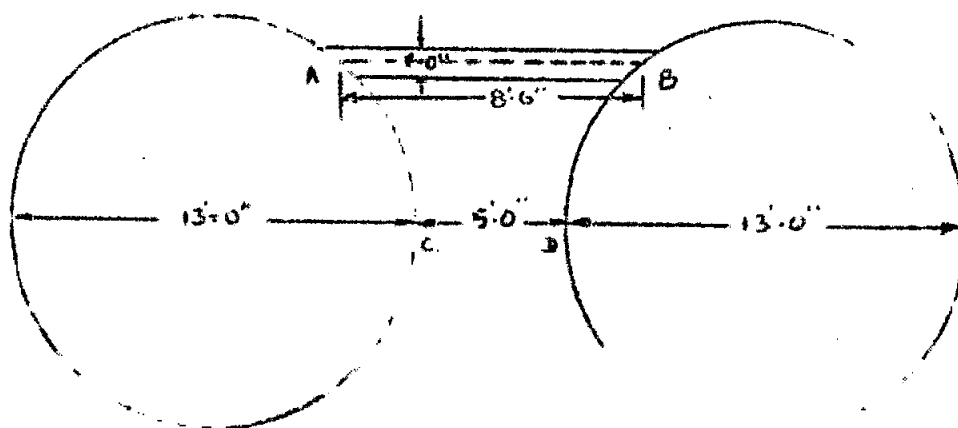
$$= \frac{1227230}{(21 \times 13) + (22/7 \times 5^2)} = 4,253 \text{ lbs/sq.ft}$$

Self weight of 24" thick well cap(say)

300 lbs / Sq.ft

Total

4553 lbs/sq.ft



1) Span A.B.

Considering 1'-0" width of strip at the end of the dispersed load in the space between 2 wells

Clear span at the centre of the strip  $8.6'$

Effective depth of slab 24" - (2" + 0.5") = 21.5" or 1.8 feet

Therefore effective span  $8.6 + 1.8 = 10.4'$

Maximum Bending moment  $4553 \times 10.4^2 \times 12 = 5,90,942 \text{ in lbs}$

d) required

$$\sqrt{\frac{590942}{126 \times 12}} = 19.9"$$

required =  $\frac{590942}{18,000 \times 0.872 \times 21.5} = 1.75 \text{ Sq.in}$   
 1" dia bars at 5" centres giving  $A_s$  1.88 sq. inches will be provided

ii) Span C.D. 5'-0" clear

Effective span 6.8'

Maximum bending

$$\text{moment} = \frac{4553 \times 6.8^2 \times 12}{10} = 2,52,636 \text{ in lbs}$$

$$A_{s \text{ required}} = \frac{2,52,636}{18000 \times 0.872 \times 21.5} = 0.748 \text{ Sq.in}$$

1" dia bars at 12" centres giving  $A_s$  0.785 sq.in will be quite sufficient

iii) Design of cap inside wells

Clear span of circular slab = 9'-0"

Effective span = 10.8'

$$\text{Maximum Bending moment at centre } \frac{WL}{24} = \frac{4553 \times 1.8^2 \times 12}{24} = 2,65,731 \text{ in lbs}$$

$A_s$  required in

$$\text{both directions} = \frac{265731}{18000 \times 0.872 \times 21.5} = 0.786 \text{ sq.inch}$$

1" dia. bars at 12" centres giving 0.785 sq.in will be used.

The arrangement of bars will be as follows:-

Along the length 1" bars at 5" centres at end to 12" centres at centre

TRANSVERSE DIRECTION:

iv) Design of cap inside wells

Clear span of circular slab

= 9'-0"

Effective span

= 9'-0" + (24" - 3.5")

= 9'-0" + 1.7'

= 10.7'

$$\text{Bending moment at centre } \frac{WL}{24} = \frac{4553 \times 10.7^2 \times 12}{24} = 2,60,636 \text{ } \cancel{2,60,700} \text{ in lbs}$$

$$\text{Area of steel required } \frac{2,60,636}{16000 \times 0.872 \times 20.5} = 0.81 \text{ sq.in}$$

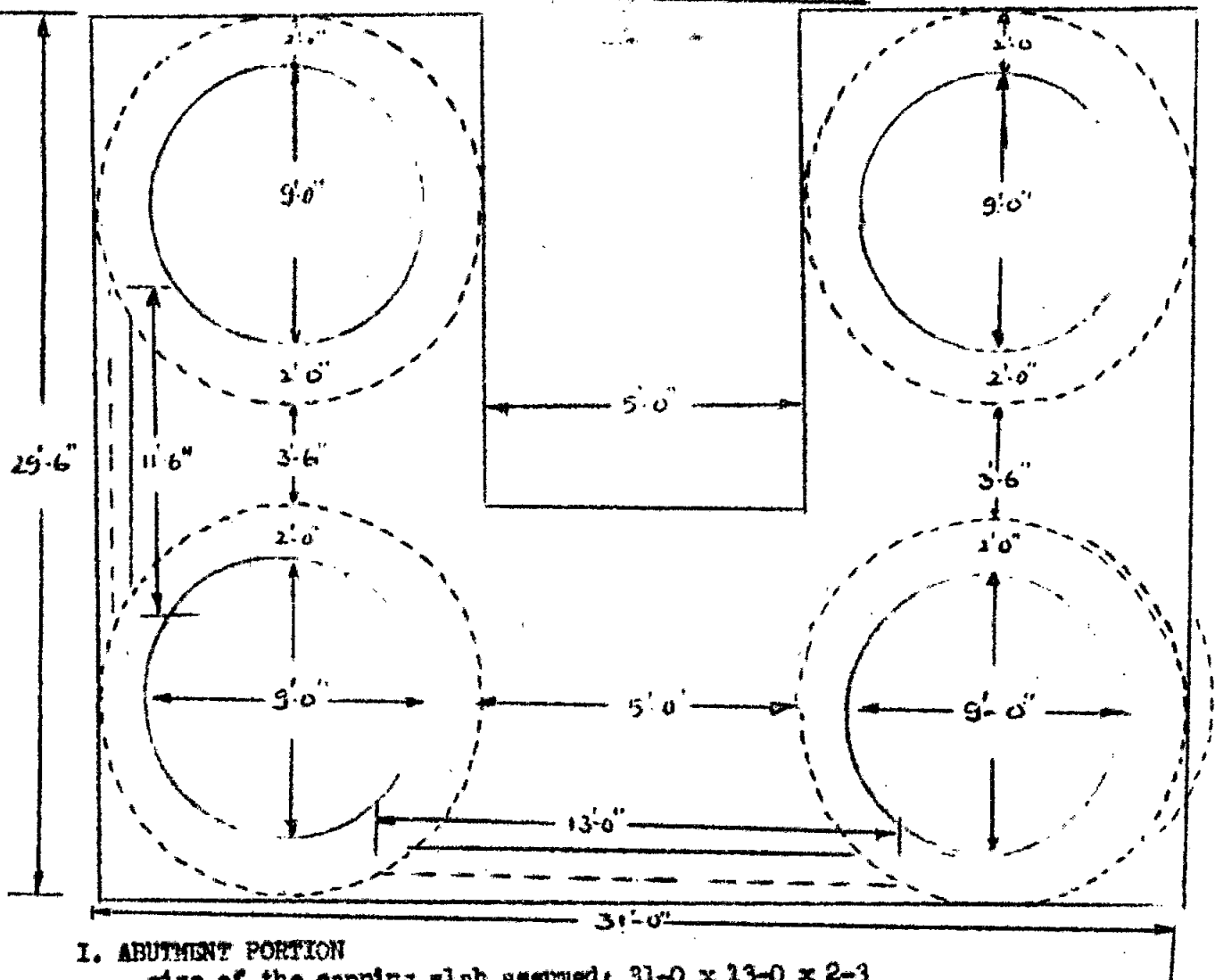
Hence adopting 1" dia rods

spacing:

$$\frac{0.785 \times 12}{0.81} = 11.6"$$

Provide 1" dia rods at 11.6" centres giving an area of .819 square in

# DESIGN OF CAPPING SLAB OVER ABUTMENT WELLS.



## I. ABUTMENT PORTION

size of the capping slab assumed: 31-0 x 13-0 x 2-3

i) Super structure load on walls

|                                     |                                                                     |                 |
|-------------------------------------|---------------------------------------------------------------------|-----------------|
| a) Dead load, uniformly distributed | $7864 \times 48$                                                    | $= 3,78,000$    |
| b) Intermediate diaphragms          | $8828 \times 2$                                                     | $= 17,656$      |
| c) End diaphragm                    | $11,770$                                                            | $= 11,770$      |
| d) Bed block fixed End side         | $(21-0 \times 3-3 \times 2-4)$                                      |                 |
|                                     | $+ \left( \frac{22/7 \times 6.5^2}{4 \times 2} \times 1.25 \right)$ | $\times 150$    |
|                                     |                                                                     | $= 27,000$      |
|                                     | <b>total</b>                                                        | <b>4,43,426</b> |

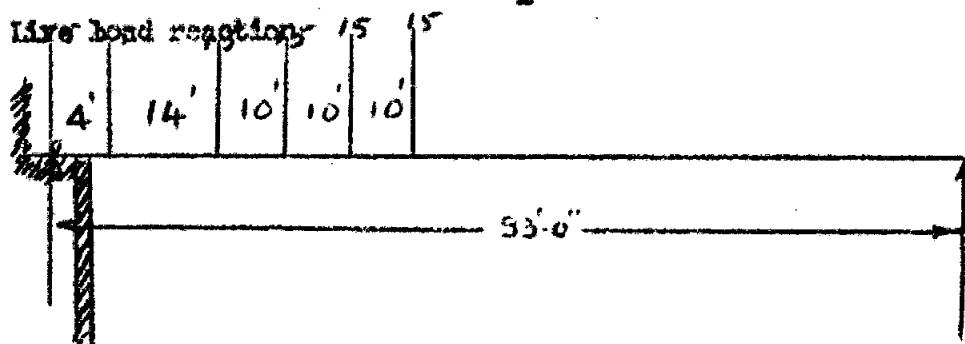
## ii) Abutment

|                                                                             |                 |
|-----------------------------------------------------------------------------|-----------------|
| $31 \times 10 \times 2 \times 140$                                          | 86,800          |
| $31 \times \frac{10+9}{2} \times 1 \times 140$                              | 41,230          |
| $21 \times \frac{4+3}{2} \times 4.04 \times 140$                            | 41,572          |
| $22/7 \times \frac{6.5^2}{4} \times \frac{4.04}{2} \times 140$              | 22,220          |
| $31 \times 5 \times 5.54 \times 140$                                        | 1,20,218        |
| $24 \times \frac{5+2}{2} \times 8.21 \times 140$                            | 96,550          |
| $2 \times 5-0 \times 3-6 \times 8.21 \times 140$                            | 40,229          |
| $2 \times 3 \times 3 \times 12 \times 140$                                  | 30,240          |
| Bevelled portion $2 \times 25/8 \times 3 \times 1/6 \times 8.21 \times 140$ | 3,592           |
| Wing portion $2 \times 1 \frac{1}{2} \times 13260$                          | 39,780          |
| (Vide wing portion calculations)                                            | <b>5,22,431</b> |

## iii) Vertical component of earth pressure

$$\frac{1160 \times 24 + 11}{2} = 20,300$$

## iv) Live load reactions



$$\text{Load } 25 \left( 1 + \frac{89}{93} \right) + 15 \left( \frac{75 + 65 + 55 + 45}{93} \right) = 87.63 \text{ Kips}$$

$$\text{For two lanes } 2 \times 87.63 \times 1000 = \frac{1,75,260}{11,52,417}$$

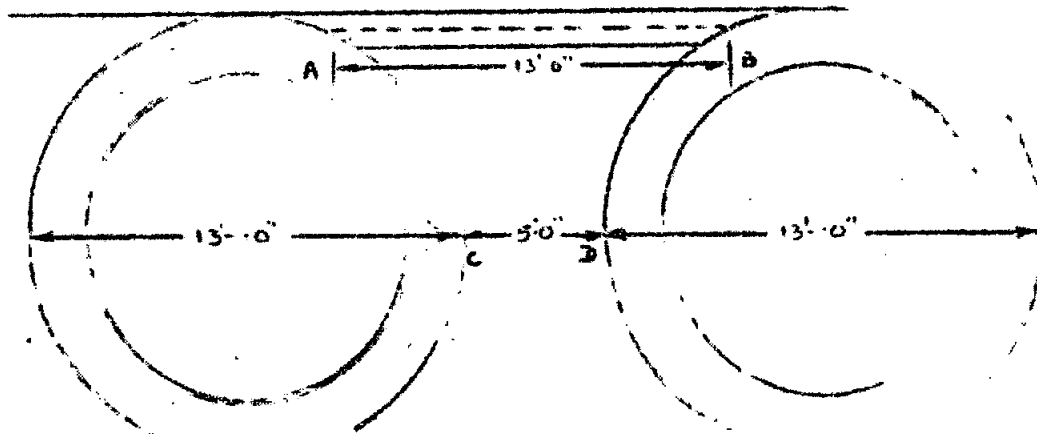
$$\text{Total load} \quad \frac{1152137}{3 \times 12}$$

$$\text{Load per square foot} = 2857 \text{ lbs}$$

$$= 337.5$$

$$3194.5 \text{ or say } 3200 \text{ lbs/Sq.ft}$$

A Considering one foot width of strip at the end of the dispersed load in the space between the two wells, (which in this case is the extreme edge)



$$\text{Clear span AB} = 13-0$$

$$\text{Effective span of slab} = 13-0 + \left[ 27'' - (2 \times 0.5'') \right] = 13-0 + 2.04' = 15.04'$$

$$\text{Maximum Bending moment} = \frac{3200 \times 15.04^2 \times 12}{10} = 8,67,810 \text{ in lbs}$$

$$\text{Depth} = \sqrt{\frac{8,67,810}{126 \times 12}} = 23.9''$$

$$\text{Area of steel required} = \frac{867810}{18000 \times 0.872 \times 24.5} = 2.25 \text{ Sq.in}$$

Adopt 1" dia rods at 4" centres, giving an area of 2.3562 Sq.in

B. Span C-D

$$\text{Clear span} = 5'-0''$$

$$\text{Effective span} = 5-0 + 2.04 = 7.04$$

$$\text{Maximum Bending moment} = \frac{3200 \times 7.04^2 \times 12}{10} = 190314$$

$$\text{Area of steel} = \frac{190314}{18,000 \times 0.872 \times 24.5} = 0.49 \text{ sq.in}$$

Adopt 1" dia rods at 12" centres giving an area of 0.7854 square inches

C Space inside wells

$$\text{Clear span} = 9-0$$

$$\text{Effective span} = 9-0 + 2.04 = 11.04$$

$$\text{Maximum bending moment} = \frac{WL}{24} = \frac{3200 \times 11.04^2 \times 12}{24} = 1,95,040$$

$$\text{Area of steel} = \frac{1,95,040}{18,000 \times 0.872 \times 24.5} = 0.50 \text{ sq.in}$$

Adopt 1" dia rods at 12" centres giving an area of 0.7854 square inches

II WING PORTION,

Load coming over the slab per foot run

$$\frac{8 + 1\frac{1}{2}}{2} \times 16.50 = 78.38$$

$$\frac{2 \times 2}{2} \times 1 = 4.00$$

$$\frac{2 + 1}{2} \times 1 = 1.50$$

$$\frac{1 + 0}{2} \times 13.58 = 6.79$$

$$\frac{1\frac{1}{2} \times 2\frac{1}{2}}{2} = 3.75$$

$$\left. \begin{array}{l} 78.38 \\ 4.00 \\ 1.50 \\ 6.79 \\ 3.75 \end{array} \right\} \times 140 = 13,219$$

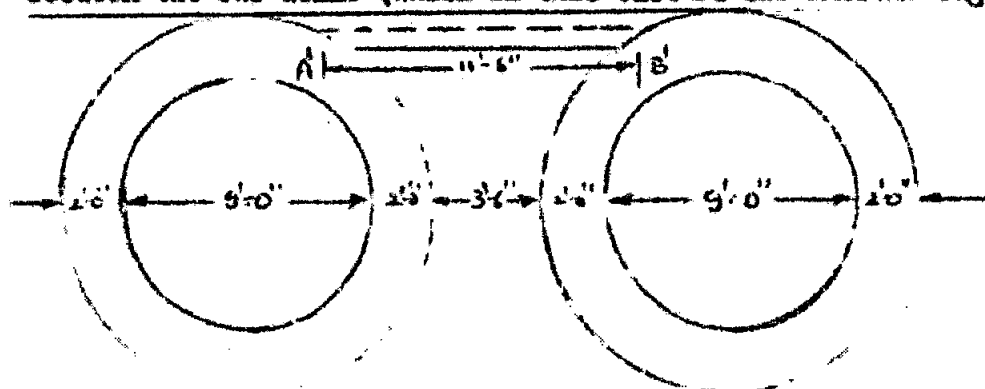
$$\text{Vertical component of earth pressure} = \frac{1,160}{14,379}$$

$$\text{Load per square foot} = \frac{14379}{13} = 1106$$

$$\text{Dead weight of slab of } 27'' = 337.5$$

$$\text{Total load per square foot} = 1443.5 \text{ or } 1444 \text{ lbs}$$

- A Considering one foot width of slab at the end of the dispersed load in the space between the two walls (which in this case is the extreme edge)



Clear span A'B' = 11'-6"

Effective span =  $11.6' + [27" - (3 \times 0.5")]$   
 $= 11.5' + 1.96' = 13.46'$

Maximum bending moment  $\frac{1444 \times 13.46^2 \times 12}{10} = 3,13,983$

Area of steel required  $\frac{3,13,983}{18000 \times 0.872 \times 23.5} = 0.62 \text{ sq.in}$

Adopt 1 1/2" dia rods at 9" centres giving an area of 1.04 square inches

Distance between walls at centres:

Clear span = 3'-5"

Effective span =  $3.5' + 1.96' = 5.46'$

Maximum bending moment  $\frac{1444 \times 5.46^2 \times 12}{10} = 51,655$

Area of steel required  $\frac{51655}{18000 \times 0.872 \times 23.5} = 0.14 \text{ sq.in}$

1" dia rods at 12" centres as provided under the abutment are continued, which give an area of 0.785 sq.in

C) Inside walls:

Clear span = 9'-0"

Effective span =  $9'-0" + 1.96' = 10.96'$

Maximum bending moment  $\frac{1444 \times 10.96^2 \times 12}{24} = 86728$

Area of steel required  $\frac{86728}{18000 \times 0.872 \times 23.5} = 0.23 \text{ sq.in}$

Adopt 5/8" dia rods 12" centres giving an area of 0.307 sq.in

Arrangement of rods:-

- i) Under abutment portion
  - a) Longitudinal direction: 1" dia rods 4" centres at edge increased to 12" centres at centres
  - b) Transverse direction: 1" dia rods 9" centres at edges of walls increased to 12" at centres of wall
- ii) Under wing portion
  - a) Longitudinal direction 1" dia rods 9" centres at edges increased to 12" centres at centre
  - b) Transverse direction 5/8" dia. rods 12" centres throughout

ANCHOR RODS FOR WALLS.

The tension developed due to transverse forces will be negligibly small. Hence, anchor rods are provided for the tension developed due to the longitudinal forces only

LONGITUDINAL FORCES (Vide pier calculations)

i) Due to traction  $= 5.0 + 0.12L$   
 $= 5 + 0.12 \times 96 = 16.52 \text{ Tons}$

This acts at  
 Lowest level of the curb 105.5  
 48.00  
 Hence lever arm =  $105.5 - 48 = 57.5$

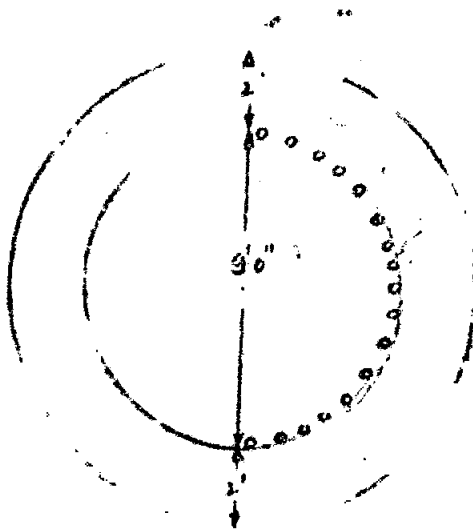
Moment developed at rock level  $16.52 \times 57.5 = 949.9 \text{ tons}$

ii) Due to cross current (vide pier calculations)

Hence moment  $\frac{1}{5} \times 0.66 \times 27 \times 5.5 \times 4^2 \times 1/2240 = 0.14 \text{ Ton}$   
 $0.14 \times 53.5 = 7.49 \text{ ft Ton}$

Total moment =  $949.9 + 7.49 = 957.39 \text{ ft ton}$

Each wall has to resist a moment  $\frac{957.39}{2} = 478.69 \text{ ft./ton}$



$$\text{Area of steel required} = \frac{M}{f_s \times jd}$$

$$\text{where } jd = \frac{(2r \times 2)}{\pi} = \frac{2D}{\pi}$$

$$A_s = \frac{478.69 \times 12 \times 2240}{18000 \times 2 \times 8.5 \times 12 \times 7/22} = 11 \text{ Sqin}$$

Adopt 1" dia rods 17 numbers giving a total area of 13.35 square inches

Total number of rods for each well 2 x 17 = 34 Nos

Depth of embedment = 45d = 3'-9"

The rock has to be drilled to a depth of 3'-9" and cement grouted.

Prn  
5/15/5  
2(10)

CEMENT AND STEEL SCHEDULE FOR HANDRAILS  
FOR APPROACHES FOR ONE PANEL OF 7'-6"

(1) CEMENT CONCRETE 1:4:8 FOR FOUNDATION WITH  $1\frac{1}{2}$ " B.S.S. HARD GRANITE METAL.

|                                | No. | L.               | B.     | D.    | Total. |
|--------------------------------|-----|------------------|--------|-------|--------|
| (a) SQUARE PORTION             | 1   | 1'-6"            | 1'-6"  | 1'-6" | + 3.4  |
| (b) TRUNCATED PYRAMID PORTION. | 1   | 1'-6"            | 0'-11" | 0'-6" | + 0.5  |
| DEDUCT FOR IMBEDMENT OF POST.  | 1   | <del>1'-6"</del> | 0'-6"  | 0'-4" | - 0.25 |

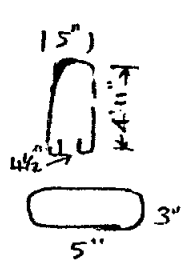
Total. 3.65 or 3.70 Cft.

(2) REINFORCED CEMENT CONCRETE 1:2:4 WITH  $\frac{1}{2}$ " B.S.S. HARD GRANITE METAL FOR HANDRAILS AND POST.

|                  |   |       |       |       |        |
|------------------|---|-------|-------|-------|--------|
| (a) FOR ONE POST | 1 | 5'-0" | 0'-6" | 0'-4" | + 0.83 |
| (b) HAND RAILS.  | 2 | 7'-2" | 0'-5" | 0'-3" | + 1.50 |

Total 2.33 or 2.50 Cft.

(3) STEEL REQUIRED FOR ONE BAY

| Description.            | No.  | Diameter.       | Length. | Total length. | Weight. | Shape.                                                                                |
|-------------------------|------|-----------------|---------|---------------|---------|---------------------------------------------------------------------------------------|
| (1) For Post.           |      |                 |         |               |         |                                                                                       |
| (a) Vertical Rods.      | 2    | $\frac{3}{8}$ " | 11'-0"  | 22'-0"        | 8.25    |  |
| (b) Links.              | 10   | $\frac{1}{4}$ " | 1'-7"   | 16'-0"        | 2.67    |                                                                                       |
| (2) FOR RAILS.          |      |                 |         |               |         |                                                                                       |
| (a) Horizontal Rods 2x4 |      | $\frac{3}{8}$ " | 7'-6"   | 60'-0"        | 22.50   |                                                                                       |
| (b) Links.              | 2x14 | $\frac{1}{4}$ " | 1'-3"   | 35'-0"        | 6.00    |                                                                                       |

Total. 39.42

Wastage. 2.00

Binding Wire. 0.58

Grand Total. 42.00 lbs.

STEEL REQUIRED PER RUNNING FOOT:  $42/7\frac{1}{2}$  = 5.6 lbs.

REINFORCED CEMENT CONCRETE 1:2:4  $2.5/7\frac{1}{2}$  = 0.71 Cft.

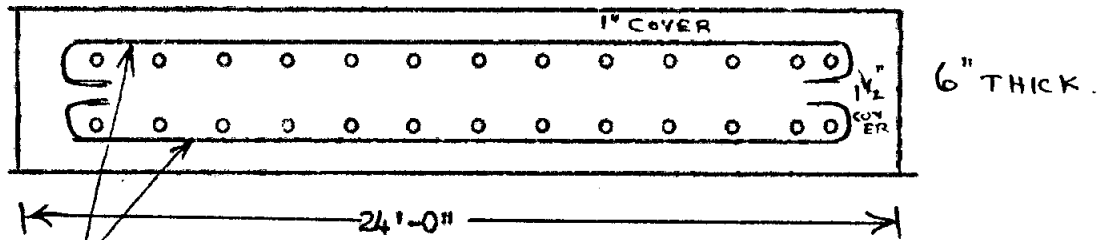
CEMENT CONCRETE 1:4:8 PER RFT.  $3.7/7\frac{1}{2}$  = 1.06 Cft.

Schedule of Reinforcement for approach slabs.

Length of approach slabs. 12'-0"

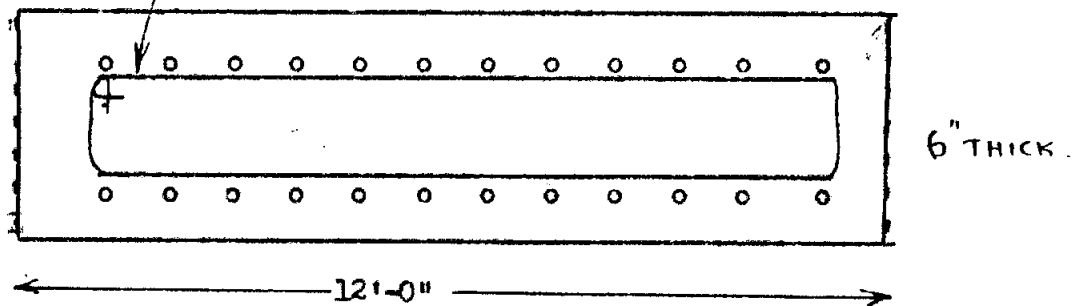
Width of approach slabs. 24'-0"

Thickness of approach slabs. 0'-6"



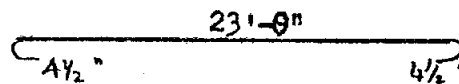
A and B rods  $\frac{1}{2}$ " diameter at 6" centres.

Distributor  $\frac{1}{2}$ " diameter at 6" centre.



Main Rods  $\frac{1}{2}$ " diameter rods at 6" centres (A) and (B)

(A) and (B)

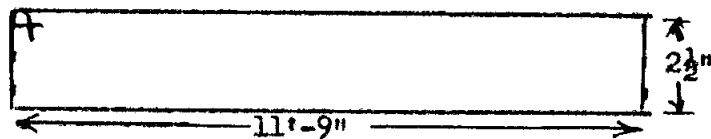


Length of each rod.  $23'-9" + 2 \times 9 \times \frac{1}{2} = 24'-6"$

No. of rods A & B  $2 \left[ \frac{12'-0" - 2 \times 1 \frac{1}{2}"}{0'-6"} + 1 \right] = 2 \times 25 \text{ Nos.} = 50 \text{ Nos.}$

Total length.  $50 \times 24'-6" = 1225 \text{ ft.}$

Distributors.  $\frac{1}{2}$ " diameter rods at 6" centres (C)



Length of each rod.  $2 (11'-9" + 0'-2 \frac{1}{2}") + 2 \times 9 \times \frac{1}{2} = 24'-8"$

No. of distributors.  $\left[ \frac{24'-0" - 2 \times 1 \frac{1}{2}" / 2 \times 3 \times \frac{1}{2}}{0'-6"} + 1 \right] = 48 \text{ Nos.}$

Total length.  $48 \times 24'-8" = 1184 \text{ ft.}$

Total length of  $\frac{1}{2}$ " diameter rods.  $1225 + 1184 = 2409 \text{ ft.}$

Weight of  $\frac{1}{2}$ " diameter rods  $2409 \times 0.668 = 1609 \text{ lbs.}$

Add for binding wire. 15 lbs.

Add for wastage. 5% 86 lbs.

Total weight of steel for approach slab. 1710 lbs.

Quantity of Cement Concrete.  $24'-0" \times 12'-0" \times 0'-6" = 144 \text{ Cft.}$

Steel/Cft of approach slabs.  $1710/144 = 11.88 \text{ lbs.}$

Total steel for both approach slabs. = 3420 lbs.

